

Index to the Supplement

to

THE CALCUTTA GAZETTE

FROM

JANUARY TO JUNE 1890.

# Index to the Supplement

TO

## THE CALCUTTA GAZETTE

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APPENDIX TO

# The Calcutta Gazette.

WEDNESDAY, FEBRUARY 5, 1890.

## PUBLIC WORKS DEPARTMENT.—MARINE.

### NOTIFICATION.

No. 23 Marine, dated Calcutta, the 30th January 1890.

NOTIFICATION—By the Govt. of Bengal, P. W. Dept.

UNDER the powers conferred upon him by section 36 of the Indian Steam-ships Act, 1884, and with the previous sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to make the following rules to regulate the granting of certificates of competency to Engineers of sea-going steam-ships :—

1. Certificates of competency will be granted to those persons who pass the requisite examinations, and otherwise comply with the requisite conditions. For this purpose Examiners have been appointed, and arrangements have been made for holding the examinations periodically at the Port of Calcutta. The examinations will be held twice a quarter, or at such other times as the Government may appoint.
2. The examinations will commence early in the forenoon, and will be continued from day to day until all the candidates who have then presented themselves and whose names appear upon the Port Officer's list on the day of examination are examined.
3. The application for examination is to be made on Form Exn. 3, which must be filled up at the Port Office. The Form Exn. 3 properly filled in, together with the Candidate's Indentures of Apprenticeship, testimonials, and discharges, must be lodged with the Port Officer not later than the day before the day of examination.
4. Applicants will be required to produce, in addition to the usual Forms of Discharge, satisfactory testimonials as to sobriety, experience, ability, and general good conduct for at least the 12 months immediately preceding the date of application to be examined, and without producing them no person will be examined. If the service has been on shore, the testimonial must be signed by an Employer; if at sea, by the Master and Chief Engineer.
5. In cases where a testimonial from the Chief Engineer, or from the Master, is for any sufficient reason not obtainable, one may be submitted from the Superintending Engineer in place of that of the Chief Engineer, and one from the Managing Owner or Secretary or Chairman of a large Company in place of that of the Master, but in every such instance the testimonial must declare that the facts stated are in accordance with the reports made by the Chief Engineer or the Master, as the case may be, or else that the facts are within the writer's personal knowledge.
6. As such testimonials may have to be verified before the Candidate can be examined, it is desirable that they should be handed in, together with the Form Exn. 3, as early as possible.

Testimonials  
of Foreigners.Certificates as  
to age.Foreigners to  
know English.Verification of  
services, &c.,  
by Articles.Service on a  
lake or river.Assistant  
Engineer.Service in home  
or coasting  
trade.Service as  
Engineer only  
accepted as  
qualifying  
service.Service as Third  
and Fourth  
Engineer.

7. The testimonials of servitude of Foreigners and of British Seamen serving in foreign vessels which cannot be verified by the Port Officer must be confirmed either by the Consul of the country to which the ship in which the candidate served belonged, or by some other recognized official authority of that country; or by the testimony of some credible person on the spot having personal knowledge of the facts required to be established. The production, however, of such proofs will not of necessity be deemed sufficient. Each case must be decided on its own merits; and if the sufficiency of the proofs given appears to be at all doubtful, the point must be referred to the Government.

8. Should any doubt exist as to the age of a Candidate, he will be required to produce a Certificate of Birth or Baptism.

9. Foreigners must prove to the satisfaction of the Examiners that they can speak and write the English language sufficiently well to perform the duties required of them on board a British vessel.

10. Services which cannot be verified by proper entries in the Articles of the Ships in which the Candidates have served cannot be counted.

11. In addition to the required workshop time, service on a lake or river, in a steamer in which the aggregate piston area of the propelling engines proper amounts to at least 2,000 (two thousand) circular inches will be accepted towards qualifying a candidate to be examined for a certificate of competency as follows:—

Two months of river or lake service, in a capacity not lower than that of Third Engineer, may be deemed equivalent to one month of sea service, provided that,

For a Second Class Certificate, not less than three months of the qualifying service must be actual sea service, and that,

For a First Class Certificate, at least six months of the qualifying service must have been at sea in a grade not below that of Third Engineer, where an engineer of a lower grade is carried. During the last 18 months of this service the candidate must have been in possession of a Second Class Engineer's Certificate of competency.

12. Service entered upon a ship's Articles as having been performed in the capacity of Assistant Engineer must be supported by proof of the Candidate having acted as Second, Third, or Fourth Engineer, as the case may be.

13. The service required by the Regulations to qualify a candidate for examination is to be regarded as referring to service in the Foreign Trade only. Service in the Home or Coasting Trade must amount to at least half as much again as that required by the Regulations to make up for the time spent in Port, e.g., for every twelve months' service under the Regulations, eighteen months' service in the Home or Coasting Trade will be required. In all cases the length of service is deemed to commence on the date of signing of the articles of agreement, and to end on the date of discharge.

14. Service in the engine-room (afterwards referred to) for qualifying a candidate to be examined for a Second-class Engineer's Certificate must be only in those capacities which afford opportunities of obtaining practical experience as an engineer; and service in the capacity of fireman, stoker, donkeyman, greaser, winchman, labourer, engineer's steward, or any other capacity than that of engineer taking watch on engines and boilers for propelling will not be accepted.

15. Service as Third and Fourth Engineer in Foreign-going steamers, where more than three or four engineers, the case may be, are carried, their names being all entered on the Articles in their respective ratings, may be accepted equally with service as Second Engineer to qualify a Candidate for examination for a First-class Engineer's Certificate, provided he has, during the whole of such service, been in possession of a Second-class Engineer's Certificate (Imperial, or under Order in Council), and provided also that he was regularly in charge of a watch. In the case of Fourth Engineers, however, eighteen months of such service must be proved for every twelve months required by the Regulations.

16. Service in a capacity below that of Fourth Engineer Service below cannot be accepted as qualifying for any class of certificate unless the testimonials of the candidate explicitly certify that during such service he has been taking regular watch in the engine-room, and that the Chief Engineer or Superintending Engineer considers him properly qualified by that experience to act as Chief Engineer of a Foreign-going steamer of 99 horse-power nominal. *In any case the applicant must prove that he has had the responsible charge of the engines or boilers on regular watch for at least twelve months of sea service, of which for not less than six months he must have been in charge of the propelling engines and rated on the articles not lower than Fourth Engineer.*

17. Having "responsible charge" will be understood to imply, in regard to the engines, that the applicant, for the time specified, was, on regular watch, the person responsible for carrying out the orders of the engine-room telegraph, and, in regard to the boilers, that he was, similarly for the period specified, the person responsible for regulating the feeds.

18. When the workshop service has been performed in a Workshop place where steam-engines are not made, and the class of work service done is similar to that required in engine-making, the service may be accepted with an additional year in the engine-room; that is, three years' workshop service and two years in the engine-room, of which one year must have been at sea. The approval of the Government must be obtained in every such case before the authority to receive a certificate is issued by the Examiners.

19. When the workshop service has been performed in a place where engines are made, and the department in which the applicant has been principally engaged is not "fitting" or "erec<sup>r</sup>ing," if the nature of the service be such as is useful training for an Engineer, the Government may, on proper representation of the circumstances, see fit to accept the service as qualifying along with subsequent experience, but in every such case the applicant must prove additional engine-room service as required above. The approval of the Government must likewise be obtained.

20. If a candidate has served in the Engine Room with a Second-class Certificate in the capacity of a Second Engineer in Foreign-going Steam-Ships under 100 horse-power, or in Home Trade Passenger Steam-Ships, which are not required by law to carry a certificated Second Engineer, his service may be accepted without reference to the vessel's horse-power, provided he has been on the ship's articles as Second Engineer, and produces certificates of discharge as Second Engineer, for the required period.

21. The Government may see fit to allow an applicant who, in consequence of service abroad, has been unable to obtain a Second-class Certificate, to be examined for a First-class Certificate, although he has not obtained a Certificate of the lower grade, provided he is able to satisfy them as to the satisfactory character of his services.

22. In such cases (para. 21) or in cases where the candidate is already in possession of a Certificate of Service, should he fail to pass the examination for the higher grade, but passes the examination for the lower grade, he may receive a Certificate accordingly, but no part of the fee will be returned.

23. A candidate who under the above regulation (para. 21) has been permitted to be examined for a First-class Certificate without first obtaining a Second-class Certificate of Competency, and who fails in his examination in practical knowledge, may not be re-examined for a Certificate of the higher grade until he has served 12 months as Second Engineer with a Second-class Engineer's certificate of competency as required by the Regulations.

24. If the candidate fails altogether, i.e., both in the examination for the lower as well as for the higher grade of Certificate (para. 21), he may be re-examined for a *Second-class Certificate only*, subject to the usual regulations relating to failure.

If after passing examination services are found to have been insufficient.

Certificate of lower grade may be granted on certain conditions.

May have to be re-examined for certificate of higher grade.

Qualification of candidate for Second-class Engineer's Certificate.

25. If after a Candidate has passed his Examination it is discovered on further investigation, e.g., by verification on the part of the Port Officer, that his services are insufficient to entitle him to receive a Certificate of the grade for which he has passed, it will not be granted to him; but if the Government are satisfied that the error in the calculation of his services did not occur through any fault or wilful misrepresentation on his part, the Certificate may be issued to him, or he may be allowed to go up for re-examination without payment of further fee, when he has performed the amount of service in which he was deficient as the Government may direct.

26. If, in such a case, the applicant's services are sufficient to entitle him to receive a Certificate of a lower grade, provided as aforesaid he has not wilfully misrepresented the amount of his services, an Inferior Certificate may be granted to him, and the difference between the fee paid by him for the Superior Certificate and the fee payable for the Inferior Certificate may be placed to his credit.

27. In such a case when the applicant has by further service made up the time in which he was found to be short, he may be required, before he can receive the higher certificate, to be re-examined in all the subjects.

#### Qualifications for Certificates of Competency.

28. SECOND-CLASS ENGINEER —A candidate for a Second-class Engineer's certificate must be not less than 21 years of age;

- (a) He must have served an apprenticeship to an Engineer for three years in England or five in India at least, and prove that during the period of his apprenticeship he has been employed on the making and repairing of engines:—Or if he has not served an apprenticeship, he must prove that for not less than three years in England or five in India he has been employed as a journeyman mechanic in some factory or workshop\* on the making or repairing of engines.† In either case he must also have served one year at sea in the Engine Room as an Engineer on regular Watch in the Foreign, Home or Coasting Trade‡; or
- (b) He must have served at least four years at sea in the Engine Room as an Engineer on regular Watch in the Foreign, Home or Coasting Trade.
- (c) He must be able to give a description of boilers, and the methods of staving them, together with the use and management of the different valves, cocks, pipes, and connections.
- (d) He must understand how to correct defects from accident, decay, &c., and the means of repairing such defects.
- (e) He must understand the use of the barometer, thermometer, and salinometer, and the principles on which they are constructed.
- (f) He must state the causes, effects, and usual remedies, for incrustation and corrosion.
- (g) He must be able to state how a temporary or permanent repair could be effected in case of derangement of a part of the machinery, or total break-down.
- (h) He must write a legible hand, and understand the first five rules of arithmetic, and decimals, and their application to questions about consumption of stores, and full capacities of tanks and bunkers, the duty of pumps, and the direct strains in engines and boilers.
- (i) He must be able to pass a creditable examination as to the various constructions of paddle and screw engines in general use; as to the details of the different working parts, external and internal, and the use of each part.

\* No period of service in a drawing office can be allowed to count for more than six months workshop time.

† These may be either land or marine engines.

‡ See paragraph 15 as to service in Home or Coasting Trade.

29. FIRST-CLASS ENGINEER.—A candidate for a First-class Engineer's Certificate must be not less than 22 years of age.

30. In addition to the qualification required for a Second-class Engineer—

(a) He must either possess, or be entitled to, a First-class Engineer's certificate of service; or, in the event of his not being so possessed or entitled, he must have served for one year at sea as Second Engineer with a Second-class Engineer's Certificate of Competency, or for two years at sea as Second Engineer with a Second-class Engineer's Certificate of Service; or having served one year at sea as Second Engineer with a Second-class Engineer's certificate of Service, he must show, in addition, at least six months' service as Chief Engineer in a vessel required by law to carry at least one Engineer holding a certificate. (*See also paragraph 15 as regards service as Third and Fourth Engineer.*)

The Examiner should therefore be satisfied that an applicant for a First-class Engineer's Certificate has not only been *in possession* of a Second-class Certificate for the periods above stated, but that he has actually *served* for such periods in the Engine Room at sea with a Second-class Certificate in the capacities referred to, and that his name has been entered in the articles of agreement accordingly. (*See also para. 21.*)

(b) He will be required to make an intelligible hand sketch, or a working drawing of some one or more of the principal parts of a steam-engine; and to mark in, without a copy, all the necessary dimensions in figures, so that the sketch or drawing could be worked from.\*

(c) He must also be able to take off and calculate indicator diagrams.

(d) He must be able to calculate safety-valve pressures and the strength of the boiler shell, stays, and riveting.

(e) He must be able to state the general proportions borne by the principal parts of the machinery to each other, and to calculate the direct stress, the torsional stress, and the bending stress in round bars, and the direct stress and the bending stress in rectangular bars with given loads.

(f) He must be able to explain the method of testing and altering the setting of the slide valves, and to sketch about what difference any alteration in the slide valve will make in the indicator diagram, and also the method of testing the fairness of shafts and of adjusting them.

(g) He must be conversant with surface condensation, superheating, and the working of steam expansively.

(h) His knowledge of arithmetic must include the mensuration of superficies and solids and the extraction of the square root, and the application of these rules to questions relating to the power, duty, and economy of engines and boilers, and to the stresses in rods, shafts, and levers of the engine.

#### Service in the Royal Navy.

31. Engineers and Assistant Engineers of the Royal Engineers, Navy are at liberty to apply for Certificates of Service, and to be examined for Certificates of Competency in the Merchantile Marine; but they must submit their applications in the manner directed by the Lords Commissioners of the Admiralty.

32. As regards the grades of Certificates of Competency Grades. for which Officers of the Royal Navy can be examined, the rule is—"First-class Assistant," or "Assistant Engineers" of the Royal Navy may be examined for Second-class Engineers' Certificates of "Competency"; "Engineers" of the Royal Navy for First-class Certificates of Competency.

\* See Appendix B.

**Temporary  
service in the  
Royal Navy.**

**Engineer  
Artificer.**

33. Temporary active service as Engineer in the Royal Navy counts in applications for Certificates of Competency in the same way and to the same extent only as in the case of the service of Mercantile Marine Engineers, that is to say, so much of the applicant's time as is spent in active service at sea, or in a ship commissioned for sea service, counts as "sea service;" and so much of the applicant's time as is spent in active service on boardship in harbour, and not commissioned for sea, counts as workshop time—See paragraph 28, sub-section (a).

34. Service performed in the capacity of Engineer Artificer may count to qualify a Candidate for examination for a Second-class Engineer's Certificate of Competency in the Mercantile Marine. If the service has been on shore, it will count only as workshop time. If in the Engine Room at sea, the Candidate must prove that during such service he had charge of an Engine Room watch.

#### Fees.

**Fees to be paid  
by applicants  
for examination.  
(Exn. 17.)**

35. Candidates for examination, in making their Application on Form Exn. 3, will be required to pay the Examination fees before any step is taken, whether by inquiring into their services or testing their qualifications, &c. No part of the fee will under any circumstances be returned to them, but should it be found that their service is not sufficient to entitle them to be examined, or that their testimonials are unsatisfactory, they will be allowed to present themselves for examination without paying any further fee, when they have fulfilled the requisite service, or are able to produce satisfactory testimonials, as the case may be.

36. The fee for examination must be paid to the Port Officer. In any case in which a candidate offers money to any other officer, and in any place but in the Port Office, the candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be examined for twelve months.

37. If a candidate fails in his examination, *no part of the fee he has paid will be returned to him.*

38. The fees are as follow:—

Second-class Engineer's Certificate	... Rs. 12
First-class Engineer's Certificate	... „ 24
First-class Engineer's Certificate if can- didate is already in possession of a Second-class Certificate of competency granted by the Board of Trade, or by the Government of a British posse- ssion under Section 8 of the Merchant Shipping (Colonial) Act, 1869	... Rs. 12
Renewal of any certificate	... „ 5

#### General Rules as to Examinations.

**Candidates not  
to take books,  
&c., into exam-  
ination room.**

39. All books necessary for the use of candidates under examination will be provided by the Government, and applicants are not permitted to take into the examination room any book, paper, document, or memoranda of any description whatever.

40. Candidates will be allowed in the time allotted to cancel any part of their work, and when required additional papers will be supplied by the Examiners, but they will not be allowed to work out the problems on a slate or on waste paper. The additional sheets must be attached to, and form part of, the examination papers.

41. Candidates for First-class Certificates have to pass an examination in Rough Working Drawing, which may, at the candidates' option, be either hand sketches clearly dimensioned and complete in the necessary views and sections, or drawings to a scale. Drawing boards and T squares will be provided by the Government, but the applicants will have to bring with them any drawing instruments they may require.\*

42. In the event of any candidate being discovered copy-ing from another, or affording any assistance or giving any information to another, or communicating in any way with another during the time of examination, he will be regarded as having failed in his examination, and will be turned back for three months, in the same manner as if he had failed in the practical part of the examination ; and no part of the fees he may have paid for examination will be returned to him. This penalty also applies to any breach of paragraph 34.

43. If a candidate leaves the room before answering any question which has been given to him, he cannot afterwards be permitted to answer it, but the Examiners may substitute other data or another question.

44. All applicants presenting themselves for examination will be required to give written answers to ten questions selected from Form Exn. 15a,\* "Elementary Questions for the first examinations of Engineers for certificates of competency, and of Masters and Mates for certificates in steam." These questions are intended to furnish a record to some extent of the candidate's knowledge at the time of his examination, and also to induce the candidates to pay more attention to their handwriting and spelling.

45. The Form Exn. 15b., on which these answers will be written, contains also some questions as to the experience of the applicant, to be answered by him in writing.

46. Examiners may add to their *vivd voce* questions on the practical management of steam-engines and boilers any of those contained in Exn. 15a.

47. If at the expiration of the time allowed the candidate has worked out and answered correctly the whole of the questions set to him, and given satisfactory answers in the *vivd voce* examination, he will be declared to have passed.

48. If at the expiration of the time allowed he has not worked out the whole of the questions set to him, but if the result of the *vivd voce* examination taken in connection with the answers to such of the questions as he has worked out is sufficient to satisfy the Examiners that the applicant is competent to take charge of engines of 100 nominal horse power or upwards, he will be declared to have passed.

49. In other cases he will be declared to have failed.

50. A report of the examination, and the examination papers, will be forwarded to the Port Officer on the Form (Exn. 15.)

51. If the candidate passes, he will receive the Form Exn. 16, upon which the Government will issue the certificate to the candidate, whose testimonials, &c., will be returned at the same time.

Notification of having passed will be given to successful candidates. (Exn. 16.)

#### Failure.

52. If the applicant fails in practical knowledge, he may not present himself for re-examination until he can produce proofs of THREE MONTHS' further service at sea as Engineer from the date of failure. If he fails in arithmetic or drawing only, he may come up again at any time.

#### General.

53. Certificates of Competency shall be made and issued by the Government in the forms hereunto annexed.

54. Every Certificate of Competency shall be made in duplicate, and one copy shall be delivered to the person entitled to the Certificate, and the other shall be kept and recorded by the Port Officer of Calcutta.

55. No application from the holder of a certificate granted by the Government of any other British Possession or by the Board of Trade to be examined for a certificate of the same legal value shall be entertained.

## APPENDIX A.

## Form Exn. 15a.

**Elementary Questions for the First Examinations of Engineers for Certificates of Competency and of Master and Mates for certificates in steam.****TO ENGINEER EXAMINERS.**

EXAMINERS will require all candidates to fill up a form, Exn. 15b., of which a copy is enclosed, and they will forward the same to the Port Officer for transmission to the Government along with the report of the examination.

It is intended to issue questions of a more advanced character for first-class candidates, but in the meantime the questions for both classes of Engineers and also for Masters and Mates passing a Voluntary Examination in steam will be taken from the same book of "Elementary Questions," and candidates for first-class certificates are expected to show their superiority by giving answers more complete than those of the other candidates.

The arithmetical questions for Engineers and the *oral voice* examinations for all candidates will be continued as heretofore, and failure in the elementary questions will be treated as failure in arithmetic.

The numbers of the questions for each examination will be selected by the examiners, and they are not to be communicated to the candidate until his examination commences.

Masters and Mates may cancel questions A, B, and C, but they should fill up the form for questions D, E, F, and G, as evidence of their practical knowledge.

**Exn. 15b.**

Port	Class for which examined
Date	Candidate's name

A. Where and how long did you serve in works at the making or at the repairing of Engines, and in what capacities?

B. How long have you served as fireman or trimmer?

C. How long have you served in the engine-room at sea, and in what capacities?

D. With what descriptions of Engines have you served at sea—Paddle or Screw or both, Jet Condensing, Surface Condensing, or Non-condensing Engines, Compounds, Trunks, Inverted Cylinders, or Horizontal Engines? What size were the engines?

E. With what descriptions of Boilers have you served at sea—Rectangular or Cylindrical, Wet-bottomed or Dry-bottomed, Multitubular, Sectional or Flue Boilers?

F. What Engine defects have come under your notice at sea, what caused these defects, and how were they remedied? Give the names of the Steamers for verification.

G. What Boiler defects have come under your notice at sea, what caused these defects, and how were they remedied? Give the names of the Steamers for verification.

For the questions to be answered on the following pages, see the book of Elementary Questions. The questions need not be written; only the answers to them.

( 9 )

Question No.

**ELEMENTARY QUESTIONS.**

1.

What parts of an engine are generally made of wrought-iron ?

2.

What parts of an engine are generally made of cast-iron ?

3.

For what parts of an engine is steel sometimes used ?

4.

What parts of an engine are generally made of brass or gun-metal ?

5.

Where is "white metal" sometimes used ? On account of what property possessed by it is it adopted ? What objection is there to its more general use ?

6.

For what parts is Muntz metal sometimes used? Is it malleable?  
For what properties is it valued?

7.

What difference is there in the composition of cast-iron, of wrought-iron, and of steel?

8.

How can cast-iron, wrought-iron, and steel be distinguished from each other?

9.

What are the different properties of cast-iron, of wrought-iron and of steel?

10.

What is meant by the terms "breaking stress," "proof stress," "safe working stress"?

11.

What is the cohesive strength or breaking stress of good ordinary wrought-iron?

12.

Tempering steel: how is it done, and in what order do the colours come?

13.

What is case-hardening?

14.

Which of the common metals or alloys can be forged, and which of them are brittle or "short"?

15.

What is meant by "welding"? Which of the common metals can be welded?

16.

The expansion of metals by heat: give examples of this in the engine and in the boiler.

17.

In the construction of cylindrical marine boilers, for what parts have the plates to be worked hot? When the material is steel, what precautionary treatment of these plates is afterwards necessary?

18.

What is double riveting? In what parts of cylindrical marine boilers is double riveting employed? In which of the shell seams is it most necessary?

19.

What is "caulking," and how are seams prepared for caulking?

20.

Describe the different ways of fastening the ends of the main stays of a boiler. What are the merits of, or objections to, the different plans?

21.

What strain per square inch is allowed on boiler stays?

22.

Describe a riveted stay, and state where such stays are commonly used.

23.

Where are thin plates to be looked for in a boiler as it wears, and how is the thinness to be detected?

24.

How are boiler tubes fixed? What are "stay tubes," and how are they secured?

25.

Where is it generally that boiler tubes leak? How is this defect raised? What are the causes of this leaking?

26.

What are the causes of cracked tube plates? Where are the cracks situated? How are they repaired?

27.

What is the difference between a "dry uptake" and a "wet uptake"? Which requires most repair? Why? Where have you seen a wet uptake?

28.

What is a superheater? What is its construction? What valves are on it? There is sometimes a gauge glass on it; what is that for?

29.

What parts of a marine tubular boiler are first injured by shortness of water?

30.

Where are angle irons sometimes used in the construction of a boiler, and where are flanged plates used?

31.

Priming: to what causes is it attributed? What means are applied to prevent it? What evils may be produced by it?

32.

Funnel draught: what makes it? What checks it?

33.

Flame is sometimes seen at the top of the funnel: what causes this appearance? Is it beneficial or is it detrimental? Why so?

34.

A blast pipe: what is its construction? Where is it placed? For what is it used?

35.

How many bottom blow-off cocks are generally fitted to each boiler, and why are they so fitted?

36.

Blow-off cocks are sometimes fitted with a spanner guard: for what purpose is this? Describe how the guard is formed?

37.

Test cocks or water-gauge cocks: where are they placed? At what heights? Must the cocks themselves be at those heights? What provision is made for cleaning these cocks should they ever become choked? When there are no test cocks how is the height of the water ascertained?

38.

What is a dead-weight safety valve? Of what are the rubbing surfaces formed? How is a lock-up valve arranged to admit of lifting it or of turning it round, and to prevent adding to the weight?

39.

About what area of safety valve is now required by the Board of Trade? What area was formerly required, and on what ground has that been altered? What is the effect of suddenly opening a safety valve when steam is up? To about what extent do safety valves rise when blowing off without being eased by hand?

40.

Spring-loaded safety valves: what advantages have they that are not possessed by dead-weight valves? What are the disadvantages as compared with dead-weight valves?

41.

Of what pieces does a glass water gauge mounting consist? How does it act? Where is it placed? At what height? Is it liable to derangement? How is its working tested?

42.

Glass water gauges have sometimes pipe connections top and bottom: what is the object of this arrangement? Should there be cocks at the extremities of these pipes?

43.

Describe a Bourdon's steam gauge. Some gauges have an inverted siphon pipe below them: what is its use?

44.

Why is a small cock sometimes put on the pipe leading to a steam gauge? Where should it be placed, and what error might be made by omitting to use it?

45.

Do steam gauges indicate the total pressure of the steam, or only portion of that pressure? What is the pressure measured from?

46.

What is meant by the salting of the boiler? How is this prevented? What is the density of ordinary sea water? How is the density ascertained? What is the difference between the formation of scale and the salting of the boiler? What is the maximum density at which boilers should be worked at sea?

47.

Scum cocks and pipes: how are they arranged? Where are they placed? At what height in the boiler? When are they used? When must they be shut? Neglect of these cocks lead to what dangers?

48.

Scale: of what does it consist? Where is it most objectionable? How is it removed? How is its formation prevented? What evil effects are produced by it?

49.

What is a salinometer? Of what does it consist? How does it act? How is it graduated? Can it be used at any temperature indiscriminately?

50.

What harm may be done through the check valve of one of a set of boilers being defective while under way? How would you work to avoid this harm?

51.

How is the leak from a split tube stopped in a boiler at sea? Describe the operation?

52.

What is the use of dampers? Where are they fitted? When should they be used?

53.

When there are no dampers fitted, what is used instead? What evil to the boiler is sometimes attributed to this? When the heating surfaces are clean does this occur?

54.

Describe the piston of a steam cylinder, with its different rings and their uses? There are generally round pieces let in flush on one side of a piston: what are they? How are these pieces fixed?

55.

Cylinder drain cocks: what is their use? There is sometimes a valve upon each cock: what purpose does it serve?

56.

Cylinder escape valves: of what do they consist? How protected? How regulated? When are they most needed? To what danger do they expose the Engineer? What precaution is sometimes used to obviate this danger?

57.

What is a compound engine? What different kinds are there for screw steamers, in respect to the number and arrangement of their cranks and cylinders? What is a triple expansion engine?

58. \*

What is link motion? What are some of its advantages? In modern engines for the screw propeller when there is no link-motion, what takes its place?

59.

What is a separate expansion valve? Why is it not fitted to all engines? What effect has an expansion valve upon the starting and upon the reversing of the engine?

60.

What arrangement is applied to reduce the friction of a slide valve? To what is the friction due?

61.

Describe a loose eccentric; how does it act? In what engines is the loose eccentric still employed?

62. \*

What is the travel of the eccentric rod? How is it measured on the eccentric? What is the travel of the slide valve when the link motion is in mid gear, and the engine still moving?

63.

What are "double beat valves"? Why are they not generally used for safety valves? Are they ever used instead of the slide valve? What objections are there to their use?

64

What is a circulating pump? Is it always worked by the main engine? Give an example from your last steamer of the three water temperatures generally noted by careful engineers?

65.

An air valve is sometimes fitted to a circulating reciprocating pump: what purpose does it serve?

66.

What is the difference between a bucket air-pump, a piston air-pump, and a plunger air-pump?

67.

Whether are double-acting air-pumps made with plungers, with pistons, or with buckets?

68.

What is an air-pump trunk? When is it necessary? How is it attached to the bucket?

69.

What class of air-pump requires both foot and delivery valves, and in what other class can either of these valves be in some cases dispensed with?

70.

When under way, when the air-pump bucket is at the top of its stroke, at what height is the water in the condenser?

71.

With a surface condenser and a single acting air-pump, what is the effect of a leaky foot valve, and what is the effect of a leaky bucket when there is also a foot valve?

72.

Air-pump pet cock or valve: where is it placed? How does it act? What is its object? Does it in every case reduce the effective capacity of the pump? Is it equally applicable to double-acting pumps?

73.

At what temperature is the hot well worked? What is the effect of higher temperatures? What is the effect of lower temperatures? What limits the lowness of temperature? Has a very low temperature any disadvantages?

74.

Bilge injection with common condensers: what are the fittings required? When is it used? What precautions are necessary in using it?

75.

When surface condensers are used, what takes the place of the bilge injection? To what is the connection made? How is its valve formed? Why is this necessary?

76.

What are the practical guides to the proper amount of opening of the inlet valve for the circulating pump?

77.

Feed-pump pet cock or valve: where is it placed? What is its use? How does it act? Is it always a necessary fitting?

78.

What are some of the ways of fastening the ends of surface condenser tubes? About what size and about what thickness are condenser tubes? What parts of a surface condenser are made of brass?

79.

What is a blow-through valve or cock? To what is it attached? There is sometimes a valve that, when opened, admits steam from the slide valve casing to the exhaust port; what is its use? To which cylinder is it fitted?

80.

What is a shifting valve? What is its use? Where is it placed? Can it be placed too high? Can it be placed too low? At what height should it be placed? Was there one in your last steamer; if so, where was it? Why are shifting valves generally omitted now?

81.

What connections are generally fitted to the donkey-pump, and to what services can it be applied?

82.

When the engines are stopped with steam up, what are to be shut and what are to be opened?

83.

How is an engine heated up before starting? What precautionary examinations are made before starting?

84.

What is an interceptor or catch-water? Where is it fixed; what is its construction; how does it act; and what attention does it require?

85.

Describe an air-pump bucket, with its valve or valves and its packing? Of what are the valves generally made?

86.

Of what materials are air-pump rods made? Why so?

87.

What is the racing of the engine? When does it occur?  
What danger attaches to it? What is done to prevent it?

88.

What are marine governors? What is their general construction? How do they act?

89.

What is meant by the "pitch" of a screw propeller? How is it measured?

90.

Explain the difference between a "right hand" and a "left hand" propeller, and state how each of them revolves.

91.

What is the slip of a screw propeller? How is its amount expressed in figures?

92.

Which of the valves about engines and boilers have to be worked by hand, which of them work self-actingly, and which are worked by the motion of the engine?

93.

Why is soda sometimes put into a boiler, and how is it put in when under way? What is the kind of soda used?

94.

Tallow cups for cylinders were sometimes made with two small cocks, or with only one small cock, or with one large hollow plug cock, or with one small cock and a valve; which of these is suitable for a high-pressure cylinder, and which for the cylinder of a condensing engine? Describe how the cup with only one small cock is used? What is now generally used instead of these? How has this change come about?

95.

Does a cylinder escape valve, self-acting, allow all the water to escape; if not, how much is left in the cylinder?

96.

What is a "Steam Lubricator" (sometimes called an Impermeator)? Explain its action? To what part of the engine is it connected? Whether will throwing cold water over it make it work faster or slower? Describe the one used in your last steamer?

97.

A common paddle wheel: of what is the centre made? Of what are the arms formed? What is the form of the bolts which attach the floats to the arms? How are the arms attached to the centres?

98.

Why have some paddle wheels one or more cast-iron floats in each wheel? With what engines are these most required? At what part of the circumference are they placed?

99.

Why are paddle wheel floats sometimes made of different breadths in the same wheel? With what description of engine is this most needed? Where are the broad floats placed, and where are the narrow floats placed in the circumference of the wheel?

100.

What difference is there between a radial paddle wheel and one with feathering floats? What is the object of feathering floats? Are all the eccentric rods attached in the same way, and are they all of the same form?

101.

Whereabout is the centre of the eccentric of a paddle wheel with feathering floats placed? In that case are the feathering levers on the striking face or on the back of the float? When the paddle shaft has an outer bearing, how is the eccentric made?

102.

Of what materials are the working surfaces of a paddle wheel with feathering floats? Are they all lubricated? With what?

103.

What is a "Disconnecting Paddle Engine"? At what place is the disconnecting effected? How is it accomplished? In which of the cranks of a disconnecting engine are the crank pins fixed?

104.

Whether is link motion valve gear or the loose eccentric generally used for disconnecting paddle engines? For what steamers are disconnecting paddle engines frequently employed?

105.

What are expansion joints? Where are they necessary? What attention do they require? Of what should the working surfaces be made?

106.

What omission in the construction of expansion joints may lead to a serious accident when steam is first applied? How is this prevented in the construction of a steam trunion pipe for an oscillating engine?

107.

Describe an oil cup with a siphon worsted? How is the worsted arranged? How is it cleaned? How far down the tube does it extend?

108.

Describe a thrust bearing; which of the surfaces wears? Why are there sometimes a number of oil tubes for one thrust bearing?

109.

What parts of a screw shaft are generally covered with brass? Why is this necessary? About what thickness is the brass?

110.

What is the stern tube or screw shaft pipe? Why is a pipe of such a length required? Of what is it made? How is it fixed at each end?

111.

What is a lignum vitae bearing? How is the wood fitted? Where is such a bearing generally used?

112.

How is a screw propeller fixed on the shaft? What means are used to prevent its getting loose at sea?

113.

Where are sluice valves placed? What large sluice valve is there in almost all screw steamers? From what position should this valve be worked? Why so? What attention should it receive?

114.

With a condensing engine, what valves or cocks are on the skin of the ship in the engine-room and in the stokehole?

115.

What are the necessary fittings of a marine boiler?

116.

With a surface condensing engine, what cocks or valves are open some time before the engine is started so as to be ready for starting whenever the order is given?

117.

What is a steam jacket? What cocks are on it? In what engines are jackets most generally used? Do they require to be felted?

118.

What parts of an engine or its fittings should be felted or otherwise protected from radiation?

119.

What are the small cylinders sometimes fitted on the slide valve casing cover of vertical engines? Explain their action? To what are they connected by a pipe? Why so?

120.

Name the principal pipes in connection with the engines and boilers of a steamer, and state to what the ends of these pipes are connected?

121.

Through what cocks or valves, pipes and chambers does the water pass on its way from the sea inlet rose plate to the water space of the boiler, with a jet condenser?

122.

Through what cocks or valves, pipes and chambers does the circulating water of a surface condenser pass?

123.

Through what cocks or valves, pipes and chambers does the steam pass from the boiler until it is in the form of water in the hot well?

124.

Name the pieces of the engine through which the pressure of the steam is transmitted from the piston to the screw propeller. Name them in the order in which they act.

125.

What is an air vessel? How does it act? At what parts of an engine or of its fittings are air vessels generally applied?

126.

What is the construction of a mud box? Where should mud boxes be placed? Why are they necessary? How should the space be divided by the rose plate, and why?

127.

What is a trunk engine? When used in a horizontal engine for a right-hand screw propeller, at which side of the vessel should the cylinders be placed? Why so?

128.

What is an oscillating engine? For what steamers are oscillating engines generally adopted? Why? How is the steam conveyed to and from the slide valve casing?

129.

Of what parts does the valve motion gear of an oscillating engine consist?

130.

For what have geared engines sometimes been used? Of what were the cogs of the large wheel made?

131.

At what part of a screw steamer is the pressure that propels it applied to the hull?

132.

At what part of a paddle steamer is the pressure that propels it applied to the hull?

133.

About how much fuel per indicated horse power per hour is required by modern steam engines, common, compound and triple expansion?

134.

What is the explanation of the economy of the surface condenser?

135.

What is the construction of a surface condenser? Of what are its tubes made? How are they fixed? How are they kept tight? What is done with a split tube?

136.

Where do surface condensers foul? How are they cleaned?

137.

What non-conducting substances are employed to prevent radiation, and how are they applied?

138.

In the construction of smoke-box doors and of dry uptakes, what provision is made to lessen the amount of radiation?

139.

How can the formation of black smoke be prevented? Describe smoke preventing apparatus?

140.

What is meant by "circulation" in a boiler, and what are the results of defective circulation?

141.

What means are sometimes adopted to improve the circulation in a boiler?

142.

By what arrangement is the circulation promoted in a "haystack" boiler?

143.

Describe a ship's side air-pump discharge valve? In what respects does it sometimes differ from a common stop valve, and what attention does it require?

144.

What is the construction of a feed escape valve, to what is its discharge connected, and how is its loading regulated?

145.

When there is no feed escape valve, what is the arrangement of the feed valves or cocks?

146.

What is the measure of a horse power? How is indicated horse power ascertained?

147.

Has "nominal horse power" a fixed meaning? What is the use of this expression? What is generally taken as the measure of one horse-power nominal?

148.

What is "back pressure" in a cylinder? About how much is it in each of the cylinders in your last steamer? Is excessive cushioning ever a trouble under certain conditions in modern engines? Say when and why and in which cylinder this occurs?

149.

What is meant by "speed of piston"? About how much is the speed of piston in modern marine engines?

150.

What is "atmospheric pressure"? What is the average amount? What instrument tells this amount?

151.

What is "gross pressure" or "absolute pressure"? What pressure is it that is shown by the steam gauge?

152.

What is meant by "cutting off" steam? How is it done? What part of the valve regulates the cut off?

153.

What is a piston slide valve? Describe its construction? Why are such frequently employed in place of the common slide valve? What is a great drawback to the use of these valves?

154.

What fixes the time of closing the exhaust? After the exhaust is closed and before the port opens for steam, what becomes of the steam that is in the cylinder?

155.

What is the "lead" of the valve? What is its object? About what amount is it?

156.

What is the "cover" or "lap" of the valve? What is its object? About what proportion of the stroke of the valve is it made?

157.

What is the "exhaust cover" of a slide valve? What is its effect upon cushioning and upon exhaust?

158.

What is "minus cover" or "minus lap" on the exhaust? What is its effect upon the exhaust and upon cushioning?

159.

What is "cushioning" or "compression" in a steam cylinder? How is it affected by the amount of cover or of minus cover there may be upon the exhaust? How is it affected by the exhaust pressure?

160.

What is "mean effective pressure"? How is its amount ascertained?

161.

What is a dial vacuum gauge? What is its construction? For what is it used? About what amount should it show when the engine is working all right? What effect has the variations it indicates on the performance of the engine?

162.

Does the vacuum gauge enable you to tell what pressure there is in the condenser, or must you have recourse also to the barometer to arrive at that? How would you ascertain the actual amount of back pressure there is in the condenser?

163.

What is a barometer? What is its construction? Is a barometer sometimes used instead of a vacuum gauge? In what respect does the weather barometer differ from the vacuum gauge barometer?

164.

The common vacuum gauge and the common steam gauge: in which of them are the graduations marked from atmospheric pressure? Does either of them tell what is the true actual pressure in the boiler or in the condenser?

165.

Do steam and vacuum gauges vary with the variations of the weather barometer? When the weather barometer varies from 30 to 31, how much will the vacuum gauge vary, and how will that affect the working of the engine? Why so?

166.

Vacuum is generally stated as so many inches. What is meant by, say, 20 inches vacuum? What does that tell us about the absolute pressure of the vapour then in the condenser?

167.

From what depth will a pump draw water? Is there any limit? Why?

168.

What is vacuum? Can vacuum move a piston? When the temperature of the water in the condenser is 212°, what is the greatest degree of vacuum there can then be in the condenser?

169.

What is a thermometer; its construction? What is the property of matter that is the principle of its construction? What temperatures are regularly noted by careful engineers?

170.

What is the temperature of (1) melting ice, (2) of boiling water, (3) of steam about 60 lbs. pressure by the steam gauge, (4) of steam about 100 lbs., and (5) of strain about 150 lbs.; also (6) of smoke in the funnel, and (7) of water in the hot well?

171.

What is meant by the "conduction" of heat? Give examples of it in the boiler and in the engine.

172.

What is meant by the "convection" of heat? Give examples of it in the boiler and in the engine.

173.

What is meant by "radiation" of heat? Give examples of it in the boiler and in the engine.

174.

Which is convection, which is radiation, and which is conduction in the following cases: (1) Heat from the glowing fuel to the furnace crown. (2) Heat passing from one side of the furnace crown plate to the other. (3) Heat passing from the steam pipes in the engine-room. (4) The heat of evaporation?

175.

What are the effective heating surfaces of a marine boiler? What is an objection to vertical heating surfaces?

176.

What parts of a marine engine are exposed to danger when the temperature is below freezing point?

177.

What precautions are necessary in cold climates when the temperature is below freezing point?

178.

State as many ways as you can by which a boiler might not get its full feed; that is, a boiler, or one of a set of boilers, gets short of water although the feed valve is open its proper amount; to what causes might this be due?

179.

Of what are furnace bars generally made? About what thickness are they at top? About what space is between them? Whether are the bars put further apart for Newcastle coal or for Welsh coal?

180.

Which burns faster, Newcastle coal or Welsh coal? Which is the flaming coal? Which makes most smoke?

181.

About how many tons of steam coal will be burnt per day in four furnaces each 3' 0" wide, and of about the usual length? On what grounds do you say so?

182.

About how many tons of steam coal will be burnt per day with good compound engines to drive an ordinary steamer of 40 ft. beam 10 knots an hour by steam alone? On what grounds do you say so? What percentage more coal would be required to propel the same steamer one knot faster?

183.

About how many tons of steam coal will be burnt per day with a good compound engine, surface condensers, the low pressure cylinder 70 inches diameter, doing average work? On what grounds do you say so?

184.

A pair of inverted cylinder direct acting engines, there is a liner half an inch thick between the ahead eccentric rod and the eccentric strap, in overhauling the engine this piece is lost and forgotten; what difference will its omission make in the working of the engine, on the admission, on the cut off, and on the exhaust of the steam? Which will take place earlier, and which later distinguishing between the up stroke and the down stroke?

185.

A pair of inverted cylinder direct acting engines driving a right-hand screw; on which of the crosshead guide bars is the pressure greatest in the up stroke, and on which in the down stroke?

186.

A screw propeller is getting loose; it has a little play on the shaft, sideways on the key or feather; how will this show in the engine-room?

187.

How would you prove whether the centre line of the trunions of an oscillating cylinder be fair with the centre line of the main shaft?

188.

How can the fairness of a line of screw shafting be tested without lifting the shafts?

## APPENDIX B.

### Form Exn. 17.

#### EXAMINATION in ROUGH WORKING DRAWING for a FIRST- CLASS ENGINEER'S CERTIFICATE of COMPETENCY.

1. The regulations in regard to the qualifications of a candidate for a first-class Engineer's Certificate of Competency specify that—

"He must be able to make rough working drawings of the different parts of the engines and boilers."

"He must be able to state the general proportions borne by the principal parts of the machinery to each other."

2. In accordance with these clauses, a candidate for a first-class certificate is required to make a rough working drawing of the parts specified on the other side of this leaf. A mechanic who has been some years in charge of marine engines and boilers ought by this time to have familiarly in his mind the general construction of at least one set of engines and boilers, say that set he was

last with. Fine drawing is not expected, and in the proportions of the parts a wide margin will be allowed; absurd dimensions will be failure in practical knowledge.

3. The drawing must, however, be practically a working drawing, giving a sufficient number of views to show the parts fully—sections, plans, or elevations, just as the candidate would require to be supplied to him if he had to make the parts to the design of another person.

4. A clear hand sketch showing the construction, completely and fully dimensioned, will be accepted if the candidate prefers this alternative.

5. A portion only of the parts specified may be accepted in place of the whole, if that portion is sufficient to show that the candidate has a good practical idea of the construction of the parts, and a fair notion of their general proportions or dimensions.

6. Candidates are hereby cautioned not to put on paper what they have not fully considered, and deliberately intend to be understood, as their statement of what they know about the construction of any part required.

7. The statements given in by a candidate may be in themselves, apparently, of little importance, but as sample material from which the state of the candidate's knowledge of engines and boilers is to be inferred, every detail which is glaringly inconsistent with a sound knowledge of the use of the part, or in which an essential consideration has evidently been overlooked, is an important element in the description which the candidate is giving of his own qualifications.

8. The candidate is advised not to begin more than he can clearly finish in the time allowed. An important object in this part of the examination is to ascertain whether the candidate can be trusted to mark all necessary dimensions upon a sketch or a drawing. The test of this is, practically, the making of the part from the sketch without having to supply additional dimensions, and without measuring the drawing. To prove this ability the candidate must fully dimension the parts shown in his sketch or drawing, notwithstanding that the parts may be correctly drawn to scale. A drawing is fully dimensioned when no part of it is left to the option of the party who is to work to the drawing.

9. To prevent misunderstanding, however, when the candidate has been led into showing more of the details than he has time fully to finish, he should name, in the statement on the other side, the particular parts which he has fully dimensioned.

10. All dimensions should have lines and darts, to indicate distinctly the points between which the dimensions are given.

11. Beware of writing cross dimensions upon centre lines, or upon longitudinal dimension lines. This is not an order but a recommendation.

12. The candidate is not expected to design anything; he has merely to sketch or draw a something with which he is expected to be already familiar.

13. Pencil in nothing after half-past 3; all the dimensions, the figures, and the darts must be inked in; employ the remaining time in examining the drawing and in inking in any figures which may have been before overlooked, and in checking the dimensions.

14. Make sure that you will have sufficient room on the drawing sheet to show all the necessary views. You can have another sheet or drawing paper if necessary. All the paper used must be forwarded with the drawing.

15. Fill in and sign the following statement.

(Specimen.)

**Form Exn. 17a.**

**SUBJECT FOR EXAMINATION IN ROUGH WORKING DRAWING.**

*(Read the foregoing general instructions.)*

A common slide valve with its spindle. Show also an outline section of the ports at the cylinder face. Show the provision for connecting the slide valve to the spindle.

The candidate is requested to fill up the following, and to attach this paper to his drawing.

## STATEMENT BY THE CANDIDATE.

The accompanying drawing, made by me this day, without referring to any document, and without the assistance of any person, is intended by me to be sufficient for the new construction of the parts above described to fit the places of similar parts which are to be removed. The construction is similar to what I have been with in the \_\_\_\_\_ steamer \_\_\_\_\_, but the dimensions may be different.

The diameter of the cylinder is \_\_\_\_\_

The stroke of the piston is \_\_\_\_\_

The stroke of the valve is \_\_\_\_\_

The cover at top end on steam side is \_\_\_\_\_

The cover at bottom end on steam side is \_\_\_\_\_

The lead at top is intended to be \_\_\_\_\_

The lead at bottom is intended to be \_\_\_\_\_

The inside cover is + \_\_\_\_\_ or \_\_\_\_\_

The thickness of the face of valve is \_\_\_\_\_

The thickness of the body of valve is \_\_\_\_\_

The greatest opening for steam will be \_\_\_\_\_

That gives an area equal to one \_\_\_\_\_

The opening for exhaust when the crank is on the top centre is \_\_\_\_\_

That gives an area equal to \_\_\_\_\_ th of piston.

The length of the connecting rod is \_\_\_\_\_

The valve will cut off steam on the down stroke at \_\_\_\_\_

The valve will cut off steam on the up stroke at \_\_\_\_\_

*The Candidate  
may omit this  
part if he  
chooses.*

The parts fully dimensioned, in ink, are \_\_\_\_\_

Dated at \_\_\_\_\_

this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_

\_\_\_\_\_  
Applicant.

BENGAL.

Government of  
Bengal.

In accordance with Her Majesty's order in Council of the 29th June 1882, issued  
under section 8 of the Merchant Shipping (Colonial) Act, 1869.

**Colonial Certificate of Competency**

*AS*

**FIRST CLASS ENGINEER.**

To

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the  
duties of FIRST CLASS ENGINEER in the Merchant Service, I do hereby, in pursuance of Act VII of 1884, grant you this  
Certificate of Competency.

By order of the Government of Bengal,  
this \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_

Under-Secy. to the Govt. of Bengal.

BENGAL.  
No. of Certificate

*Address of Owner*

*Date and Place of Birth*

*Signature*

*This Certificate is given upon an ORDINARY EXAMINATION passed at \_\_\_\_\_ on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_*

*Any ENGINEER who fails to deliver up a Certificate which has been cancelled or suspended, is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic., cap. 63, sec. 23, to cancel or suspend Certificates.*

*N.B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.*

*Issued at the Port of Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_*

*Registered,  
Port Officer of Calcutta.*

BENGAL.

Government of Bengal.

By the Honourable the Lieutenant-Governor of Bengal.  
*In accordance with Her Majesty's order in Council of the 29th June 1882, issued  
under section 8 of the Merchant Shipping (Colonial) Act, 1869.*

**Colonial Certificate of Competency**

*as*

**SECOND CLASS ENGINEER.**

To

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the duties of **SECOND CLASS ENGINEER** in the Merchant Service, I do hereby, in pursuance of *Act VII of 1884*, grant you this Certificate of Competency.

By order of the Government of Bengal,  
this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_

Under-Secy. to the Govt. of Bengal.

BENGAL.No. of CertificateAddress of OwnerDate and Place of BirthSignature

This Certificate is given upon an ORDINARY EXAMINATION passed at \_\_\_\_\_ on the \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_

Any ENGINEER who fails to deliver up a Certificate which has been cancelled or suspended, is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic., cap. 63, sec. 23, to cancel or suspend Certificates.

N.B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.

*I*sued at the Port of Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_.

Registered,  
Port Officer of Calcutta.

No. 24 Marine, dated Calcutta, the 30th January 1890.

**NOTIFICATION—By the Govt. of Bengal, P. W. Dept**

UNDER the powers conferred upon him by section 36 of Act VII of 1884 (the Indian Steam-ships Act), and with the previous sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to make the following rules to regulate the granting of certificates of competency to engine-drivers of sea-going steam-ships having engines of under 50 nominal horse-power :—

1. Certificates of competency will be granted to those persons who pass the requisite examinations and otherwise comply with the requisite conditions. For this purpose examiners have been appointed and arrangements have been made for holding the examinations periodically at the port of Calcutta. The examinations will be held twice a quarter, or at such other times as the Government may appoint.
2. The application for examination is to be made in Form Exn. 3a, which must be filled up at the Port Office. The Exn. 3a properly filled in, together with the candidate's testimonials, must be lodged with the Port Officer not later than the day before the day of examination.
3. A candidate for a certificate of competency under these rules must be not less than 22 years of age.
4. He must have served three years as principal serang or tindal in the engine-room of a sea-going steamer under a certificated Engineer.
5. He must have the testimonial shown in Appendix A filled up by the Engineer with whom he has last served, or his other testimonials must contain all the particulars therein required.
6. He must pass a *vivd voce* examination before the Board of Examiners as to the working of an engine and the use of its different parts.
7. He must, if required, be able to show his practical qualifications by one week's trial in a steamer, after fulfilling the other tests to which he will be subjected.
8. He must show a knowledge of the use of brine cocks and blowing off, of the salinometer, and of the care of the boiler in salt-water.
9. Candidates for examination, in making the application on Form Exn. 3a, will be required to pay the examination fee before any step is taken, whether by enquiring into their services or testing their qualifications, &c. No part of the fee will under any circumstances be returned to them; but should it be found that their service is not sufficient to entitle them to be examined, or that their testimonials are unsatisfactory, they will be allowed to present themselves for examination without paying any further fee, when they have fulfilled the requisite service or are able to produce satisfactory testimonials, as the case may be.
10. The fee for examination under these rules is ten rupees, and the amount must be remitted with the application to the Port Officer. In any case in which a candidate offers money to any other officer than the Port Officer, and in any place but the Port Office, the candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be examined for twelve months.
11. If a candidate fails in his examination, *no part of the fee he has paid will be returned to him*.
12. In case of failure, candidates may be re-examined *de novo* after a lapse of six months, if the past examination showed that they might reasonably be expected to qualify.
13. Certificates of competency shall be made and issued by the Government in the form hereunto annexed.
14. Every certificate of competency\* shall be made in duplicate, and one copy shall be delivered to the person entitled to the certificate and the other shall be kept and recorded by the Port Officer of Calcutta.

APPENDIX A.  
TESTIMONIAL.

I hereby certify that has served with me in the engine-room of as principal engineer or fitter for a period of , during which time he has discharged his duties to my entire satisfaction.

I consider that he fully understands the working of an engine, and has sufficient tact, presence of mind, and energy to look after and manage the working of the engines of a sea-going steamer having engines of under 50 nominal horse-power.

Signed  
No. and description of Certificate.

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Note.—Any Engineer giving a testimonial in this form should be very careful in doing so, as the document may materially influence the applicant's eligibility as a candidate.

By the Honourable the Lieutenant-Governor of Bengal.



Government of  
Bengal.

AS

**Certificate of Competency**

ENGINE-DRIVER OF A SEA-GOING STEAM VESSEL UNDER ACT VII OF 1884.

U

WHEREAS it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the duties of Engine-driver on a sea-going Steam-ship having engines of under 50 nominal horse-power, I do hereby, in pursuance of Act VII of 1884, grant you this CERTIFICATE OF COMPETENCY as Engine-driver.

By order of the Government of Bengal,

Given under my Hand and Seal,

The \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_. Under-Secretary to the Govt. of Bengal.

## No. of Certificate

Bearer \_\_\_\_\_ son of \_\_\_\_\_ by caste \_\_\_\_\_  
 Date & Place of Birth, showing Village, Thana and District \_\_\_\_\_  
 Residence, showing Village, Thana and District \_\_\_\_\_  
 Height \_\_\_\_\_  
 Personal description, stating particularly any permanent marks or scars \_\_\_\_\_  
 No. of Register Ticket \_\_\_\_\_  
 Signature \_\_\_\_\_  
*Any Engine-driver who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500.*  
*N. B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer of Calcutta.*  
 Issued at Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
 Registered.  
 Port Officer of Calcutta.

\* If not known exactly, must be stated on the best information or evidence.

No. 25 Marine, dated Calcutta, the 30th January 1890.

**NOTIFICATION**—By the Govt of Bengal, P. W. Dept.

UNDER section 10 of the Indian Merchant Shipping Act, 1859, the Lieutenant-Governor is pleased, with the sanction of the Governor-General in Council, to make the following rules for the conduct of examinations for Masters and Mates of foreign-going ships and as to the qualifications to be required. These rules are in supersession of the rules issued under the notification dated the 28th of August 1877.

Certificates granted to persons who pass examinations.

Examinations continued till all the Candidates are examined.

Notice of application for examination to be given to the Port Officer.

Testimonials of character, conduct, and ability required.

Testimonials of Foreigners.

Certificates as to age.

Foreigners to know English.

Verification of services, &c., by Articles

1. *Certificates of Competency* will be granted to those persons who pass the requisite examinations, and otherwise comply with the requisite conditions. For this purpose examiners have been appointed, and arrangements have been made for holding the examinations periodically at the port of Calcutta. The examinations will be held twice a quarter, or at such other times as the Government may appoint.

2. The examinations will commence early in the forenoon, and will be continued from day to day until all the Candidates whose names appear upon the Port Officer's list on the day of examination are examined.

3. Candidates for examination must make their application upon the appropriate Form (Exn. 2), which must be filled up at the Port Office. The Exn. 2, properly filled in, together with the Candidate's testimonials and discharges, must be lodged with the Port Officer of Calcutta not later than the day before the day of examination, and the Candidate must conform to any regulations in this respect which may be laid down by the Government, as, if this be not done, delay may be occasioned.

4. Testimonials of character, and of sobriety, experience, ability, and good conduct on board ship for at least the twelve months of service immediately preceding the date of application to be examined, will be required of all applicants, and without producing them no person will be examined. As such testimonials and discharges may have to be verified before the Candidate can be examined, it is desirable that they should be handed in together with the Form, Exn. 2, as early as possible.

5. The testimonials of servitude of Foreigners, and of British Seamen serving in foreign vessels, which cannot be verified by the Port Officer, must be confirmed either by the Consul of the country to which the ship in which the Candidate served belonged, or by some other recognized official authority of that country, or by the testimony of some credible person on the spot having personal knowledge of the facts required to be established. The production, however, of such proofs will not of necessity be deemed sufficient. Each case will be decided on its own merits, and if the sufficiency of the proofs given appears to be at all doubtful, it must be referred to the Government.

6. Should any doubt exist as to the age of a Candidate, he will be required to produce a certificate of birth or baptism.

7. Foreigners must prove to the satisfaction of the Examiners that they can speak and write the English language sufficiently well to perform the duties required of them on board a British Vessel. In the case of natives of India, who may not be able to speak English, their Certificates will be endorsed to the effect that they are only valid for vessels manned and officered entirely by Asiatics.

8. The time for which length of service as Seaman or Officer in the Mercantile Marine is to be reckoned in all cases referred to in the following paragraphs is to commence at the date when the Articles of Agreement were signed by the Applicant, and to end at the date when he was discharged as shown on the Articles of Agreement. The Certificates of Discharge will generally be sufficient evidence of this, but great care must be exercised by the Port Officer and Examiners to detect any tampering in any way with the information contained in them, and to report to the Government at once any suspicious cases.

9. Services, which cannot be verified by proper Entries in the Articles of the Ships in which the Candidates have served, cannot be counted. For instance, a man will state his

service to have been as Second or Only Mate, and to support his assertion will produce a Certificate of Discharge or of employment by the Master, to the effect that he served as Mate, when, on reference to the Articles, it appears that he has actually been rated as Boatswain; the service in such a case will not be regarded as having been in the capacity of Mate.

10. Whenever a man has, from any cause, been regularly promoted on a vacancy in the course of the Voyage from the rank in which he first shipped, and such promotion, with the ground on which it has been made, is properly entered in the Articles and in the Official Log Book, he will of course receive credit for his service in the higher grade for the period subsequent to his promotion. *Promotion during Voyage*

11. Service in the coasting trade may be allowed to count as service, in order to qualify a Candidate for examination for a Certificate of Competency for Foreign-going Ships, it being understood, however, that service in the coasting trade must amount to half as much again as service in the foreign trade, and that service in a lower grade than that of First or Only Mate in the coasting trade will not be recognised as officer's service. *Service in the coasting trade*

12. Three years' service as Mate in the coasting trade, together with at least nine months' service as Master, may be allowed to count as service for a Master's Certificate, provided the Candidates' entire service at sea calculated as above is sufficient, and that his services as Mate and Master in the coasting trade can be proved by the Articles, and provided he has already passed an examination *for the Foreign Trade*, unless, under special circumstances, the Government see fit to dispense with this latter provision.

13. Service in Pleasure Yachts under 80 tons, if performed within Home Trade limits, will not be accepted towards qualifying a Candidate for examination.

14. Service in Pleasure Yachts will not be accepted at all unless verified by satisfactory proofs, and it must be distinctly understood that accepted service is confined to *actual sea service*, service in harbour or port being inadmissible. See also para. 21.

15. Time for which Indentures of Apprenticeship are in force will be accepted as sea service, provided that the Apprentice has remained by the ship for at least four-fifths of the time covered by the Indentures, and the Indentures of the applicant are endorsed by the Owner or Master to whom he has been bound, to the effect that he has performed his service faithfully for the whole time agreed upon. *Service as an Apprentice*

16. Service as Third or Fourth Mate may be accepted as equivalent to service as Second Mate to qualify a Candidate for examination for a Certificate of Competency as First Mate, provided he is able to produce a satisfactory testimonial from the Master or owner of the vessel in which the service was performed, showing that he has had charge of a watch while serving as such Third or Fourth Mate, and that during the whole of the time claimed he was in possession of a Second Mate's Certificate of Competency, valid in the United Kingdom. *Service as 3rd or 4th Mate to qualify for 1st Mate*

17. Service as Third or Fourth Mate may also be accepted on the same conditions to qualify a Candidate for examination for a Master's Certificate of Competency, provided he can produce satisfactory evidence of his having served at sea 12 months as Second Mate of a Foreign-going Ship while in possession of a First Mate's Certificate of Competency, valid in the United Kingdom. If a Candidate has had no service as First Mate he must have been six and-a-half years at sea, of which two and-a-half years must have been as Mate of a lower grade under the above-named conditions. It will also be noted that occasional service in charge of a watch in the daytime will not be accepted as Mate's service under the Regulations. *Service as 3rd or 4th Mate to qualify for Master*

18. Part of the time served on board a training ship will be allowed to count as service at sea, provided that the Candidate can produce amongst his testimonials a Certificate from the Committee that he has conducted himself creditably, and passed a good examination in seamanship so *Service on board a Training Ship*

<p><b>Service in Auxiliary Screw Whaling ships.</b></p> <p><b>Service in Trawlers, Yachts, &amp;c.</b></p> <p><b>Service in capacities other than as Apprentice or Seaman.</b></p> <p><b>Service on rivers and in smooth-waters. Loss of sight.</b></p> <p><b>Service in Light Ships and Engine-room.</b></p> <p><b>Services as Pilot's Apprentice.</b></p> <p><b>Desertion and gross misconduct.</b></p> <p><b>If after passing examination services are found to have been insufficient.</b></p> <p><b>Certificate of a lower grade may be granted in certain conditions.</b></p> <p><b>Must be re-examined for certificate of higher grade.</b></p>	<p>far as practised in the training ship as well as in other matters down to the time of his leaving the ship.</p> <p>19. No period of service on board a training ship will be allowed to count for more than one year's sea service, nor can it be accepted as equivalent to service in square-rigged vessels.</p> <p>20. Service in Auxiliary Screw Whaling Ships and other Vessels with auxiliary steam power, which use their screws only in calms or during light winds, is considered as service performed in Sailing Vessels. Such service is not to be accepted in cases where service on board Foreign-going Steam-ships is required.</p> <p>21. Service performed in Trawlers, Yachts, &amp;c., <i>alone</i> will not qualify a Candidate for examination for a Foreign-going Certificate. He must show that he has served, in addition thereto, 18 months in an ordinary trading vessel.</p> <p>22. Candidates whose services have been in capacities other than Apprentice, Ordinary Seaman, or Able Seaman, <i>e.g.</i>, Cook, Steward, Carpenter, &amp;c., will be required to satisfy the Port Officer that they have a good knowledge of Seamanship. This may possibly be proved by the production of satisfactory Certificates from Masters with whom the Applicants have served. Failing satisfactory evidence, the Applicant may be required to perform additional service, which must be in the capacity of Ordinary Seaman or Able Seaman.</p> <p>23. Service performed on rivers, no matter of what size, or in smooth-water or partially smooth-water cannot be accepted.</p> <p>24. A person who has lost the sight of one eye cannot be allowed to be examined for a Certificate of Competency. If he already holds a Certificate, he will not be allowed to be examined for a Certificate of a higher grade.</p> <p>25. Service in Light Ships or in an Engine-room will not be accepted as sea service for a Master's or Mate's Certificate of Competency.</p> <p>26. In the case of service on board Excursion Steamers only such service as has been performed actually at sea can be accepted.</p> <p>27. A First Class Pilot, with one year's Sea Service since he obtained his Pilot's Certificate, may be examined for a First Mate's Certificate for Foreign-going Ships. A Hooghly Master Pilot is for the purpose of this rule to be considered a First Class Pilot.</p> <p>28. Half the amount of service performed as an Apprentice in a Pilot Vessel propelled by sails may count as actual Sea Service to qualify for examination for a Certificate of Competency.</p> <p>29. Candidates who have neglected to join their vessels after having signed Articles, or who have deserted their vessels after having joined, or who have been found guilty of gross misconduct on board, will be required to produce satisfactory proofs of two years' subsequent service and good conduct at sea, unless the Local Government after having investigated the matter should see fit to reduce the time.</p> <p>30. If after a Candidate has passed his Examination it is discovered on further investigation, <i>e.g.</i>, by verification on the part of the Port Officer, that his services are insufficient to entitle him to receive a Certificate of the grade for which he has passed, it will not be granted to him; but if the Government is satisfied that the error in the calculation of his services did not occur through any fault or wilful misrepresentation on his part, he will be allowed to go up for re-examination without payment of further fee when he has performed the amount of service in which he was deficient.</p> <p>31. If, in such a case, the applicant's services are sufficient to entitle him to receive a Certificate of a lower grade, provided as aforesaid he has not wilfully misrepresented the amount of his services, an Inferior Certificate may be granted to him, and the difference, if any, between the fee paid by him for the Superior Certificate and the fee payable for the Inferior Certificate, may be placed to his credit.</p> <p>32. In such a case when the applicant has by further service made up the amount in which he was found to be short, he must, before he can receive the higher Certificate, be re-examined in all the subjects.</p>
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## Colour Tests.

33. The Government have made the following arrangements for the Examination of persons as to their ability to distinguish Colours:—\*

34. Examinations in Colour are open to any person serving or about to serve in the Mercantile Marine.

35. Any person, including the holders of Certificate of Competency, or persons about to apply for Certificates of Competency, if desirous of being examined *in colours only*, must make application to the Port Officer on Form Exn. 2<sup>a</sup>, and pay a fee of one rupee.

36. He must on the appointed day attend for examination at the Examiner's Office; and if he passes he will receive a Certificate to that effect.

37. If he fails it will be open to him to be examined again in Colours as often as he pleases on payment of the fee of one rupee at each fresh attempt.

38. The application of a Candidate who is presenting himself for Examination for a Master's or Mate's Certificate must be made on Form Exn. 2.—Such examination will commence with the Colour test; and if the Candidate does not, at the time of making application, hold a Certificate of Competency of any grade, and should fail to distinguish correctly any one of the colours used in the test, he will not be allowed to proceed with the examination in Navigation and Seamanship.

39. The fee he has paid for Examination for a Certificate of Competency will include the fee for the Colour test, and, with the exception of one rupee, will, in such event, be returned to him.

40. A Candidate for Examination for a Certificate of Competency who, at the time of making application, does not possess a Certificate, and who fails to pass the colour test, may not be re-examined until after the lapse of three months from the date of his first failure. If he fails a second time, he will be allowed a third trial at the expiration of another three months from the date of his second failure. A fresh fee must be paid at each succeeding examination.

41. It is therefore obviously to the advantage of Candidates for Certificates of Competency to apply in the first instance to be examined in *Colours only* on Form 2<sup>a</sup>.

42. A Candidate who holds a Certificate of Competency, and who, on presenting himself for Examination for a Certificate of a higher grade, is unable to pass the Colour test, will notwithstanding be permitted to proceed with the Examination in Navigation and Seamanship for the Certificate of the higher grade.

43. Should he pass this Examination the following statement will be written on the face of the higher Certificate which may be granted to him, viz.: "This officer has failed to pass the 'Examination in Colours.'"

44. Should he ultimately fail to pass the Examination in Navigation and Seamanship a like statement, relating to his being Colour blind, will be made by the Port Officer on his existing Certificate before it is returned to him.

45. Holders of Certificates which bear the statement of their having failed to pass in Colours, and who may desire to have the statement removed from their Certificates, must obtain the special permission of the Government.

**Qualifications for Certificates of Competency for a  
"Foreign-going Ship."**

*Foreign-going  
Sailing Ships.*

46. EXAMINATION IN COLOURS.—All Candidates for Certificates of Competency must first be examined in colours.\*

47. A SECOND MATE must be not less than seventeen years of age, and must have been four years at sea. He must also prove that he has served at least one year in a square-rigged sailing vessel within the last five years. *See also para. 11.*

On and after the 1st April 1890, no Candidate will be allowed to be examined unless he has served at sea two years

\* See Appendix L.

within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the Candidate is allowed to be examined.

48. IN NAVIGATION, &c.—He must write a legible hand, and will be required to give in writing, *vide supplementary rule-roce test*, page 37, definitions of various astronomical and other terms used in navigation.\* He must have a competent knowledge of the first five rules of arithmetic, and the use of logarithms. He must be able to work a day's work complete, correcting the courses for deviation, leeway, and variation. He will be required to find the latitude by meridian altitude of the sun, and the difference of longitude from a given departure by parallel sailing; also to find the course and distance from one position to another by Mercator's method. He will be required to find the time of high water at a given port, to observe and calculate the amplitude of the sun, and to find the error of the ship's compass therefrom, and also the deviation, the variation being given. He must be able to find the daily rate of the chronometer from error observed, and to find the longitude from altitude of the sun by the usual methods. He must understand the use of the sextant, with its adjustments, and be able to observe with it, find the index error by the horizon, and *read off* and *on the arc*.† He must also pass a satisfactory examination in the International Code of Signals.‡

49. IN SEAMANSHIP, &c.—He must give satisfactory answers as to the standing and running rigging of ships; as to bending, unbending, setting, reefing, taking in and furling sail; as to sending masts and yards up and down, &c., &c.; as to the management of a ship when under canvas; of a ship's boat in heavy weather, and as to dunnaging and stowing cargo, &c. He must have a thorough knowledge of the rule of the road as regards both steamers and sailing vessels, their regulation lights, and fog, and sound signals,§ and be able to describe the signals of distress, and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals.|| He must be able to mark and use the lead and log lines. He must also understand the use and management of the rocket apparatus in the event of his vessel being stranded, and other questions of a like nature appertaining to the duties of the Second Mate of a ship, which the Examiners may think necessary to put to him. He will also be required to give satisfactory answers as to his knowledge of the additional subjects (applying more particularly to steam-ships) which are specified in the Rules of Examination for Second Mates' Certificates of Competency for Foreign-going Steam-ships.

50. AN ONLY AND FIRST MATE.—An Only Mate and a First Mate must be not less than nineteen years of age, and must have served five years at sea, of which in the case of a First Mate, one year must have been as Second or Only Mate. See also paras. 11, 16 and 27.

On and after the 1st April 1890, no Candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

*Only and First Mate.* A Candidate for an Ordinary Certificate of *any* grade, who does not already hold an Ordinary Certificate of a lower grade, must prove that he has served 12 months in a square-rigged sailing vessel within the last five years.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the Candidate is allowed to be examined.

51. IN NAVIGATION.—In addition to the qualifications required for a Second Mate, an Only and First Mate must be

\* See Appendix A.

† See Appendix B.

‡ See Appendix C.

§ See Appendix D.

|| See Appendix E.

able to find the true bearing of the sun and the error of the ship's compass from an observed azimuth of the sun, both from an altitude and also from the "Time Azimuth Tables," and with the variation given compute the deviation; to find the latitude from a single altitude of the sun off the meridian, and be able to use and adjust the sextant,\* and to find the index error by the sun; also to ascertain the true bearing of the sun, &c., and the ship's position by Sumner's Method by Projection.† He must also be conversant with the use of Mercator's Chart, and be able to find, on either a "true" or "magnetic" chart,‡ the course to steer and the distance from one given position to another; and find the ship's position on the chart from cross bearings of two objects; from two bearings of the same object, the course and distance run between taking the bearings being given; and the distance of ship from the object at the time of taking the second bearing. He must also understand how to keep a ship's Log Book. He will also be required to answer certain questions in writing (*and orally*) relative to cyclones or revolving storms.§

52. IN SEAMANSHIP, &c.—In addition to the qualifications required for a Second Mate, a more extensive knowledge of seamanship will be required, as to shifting large spars, rigging sheers, taking lower masts in and out, how to moor and unmoor ship, and to keep a clear anchor; to carry out an anchor; how to manage a ship in stormy weather; how to cast a ship on a lee shore; how to secure the masts in the event of accident to the bowsprit; and how to rig purchases for getting heavy weights, anchors, machinery, &c., in and out. He must give satisfactory answers as to the ventilation of holds and the stowage of explosives. He must also know how to rig a sea anchor, and what means to apply to keep a vessel disabled or unmanageable out of the trough of the sea, and lessen her lee drift; how to get a cast of deep sea lead in heavy weather; and answer any other questions appertaining to the duties of an Only and First Mate of a ship which the Examiners may think necessary to put to him. He will also be required to give satisfactory answers as to his knowledge of the additional subjects (applying more particularly to steam-ships) which are specified in the Rules of Examination for Only and First Mate's Certificates of Competency for Foreign-going Steam-ships.

53. A MASTER must be twenty-one years of age, and Master. have been six years at sea, of which one year must have been as First or Only Mate in a Foreign-going Ship, and one year as Second or Only Mate; or he must have been six and-a-half years at sea, of which two and-a-half years must have been as Second Mate of a Foreign-going Ship, during the last twelve months of which service as Second Mate he must have been in possession of a First Mate's Certificate. *Vide also paras. 11, 12 and 17.*

On and after the 1st June 1889, no Candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

A Candidate for an Ordinary Certificate of any grade, who does not already hold an Ordinary Certificate of a lower grade, must prove that he has served 12 months in a square-rigged sailing vessel within the last five years.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the Candidate is allowed to be examined.

54. IN NAVIGATION.—In addition to the qualifications required for a Second, Only, and First Mate, a Master must be able to compute the latitude from the meridian altitude of a star, &c. He must be able to find the magnetic bearing from

\* See Appendix E.

† See Appendix I.

‡ See Appendix F. The terms "true" and "magnetic" are used throughout the Regulations for the sake of brevity and convenience for indicating charts that have compasses engraved upon them showing the "true" or "magnetic" points of the compass respectively.

§ See Appendix K.

equidistant compass bearings of any fixed object when at sea, and compute the deviation therefrom. He must construct a deviation curve upon a "Napier's" diagram, which will be furnished by the Examiner, and understand the practical application of the same, and give satisfactory written (*and oral*) answers to certain practical questions on the effect of the ship's iron upon the compasses, the method of determining the deviation, and compensating same by magnets and soft iron.\* He will be required to find the course to steer by compass in order to counteract the effect of a given current, and find the distance the ship will make good towards a given point in a certain time and to work out practically the correction to apply to soundings taken at a given time and place to compare with the depth marked on the chart.†

55. IN SEAMANSHIP, &c.—In addition to the qualifications required of a Second, Only, and First Mate, he must be able to construct jury rudders for both wooden and iron vessels, and also rafts. He will be examined as to his resources for the preservation of the ship's crew in the event of wreck; as to the management of ships in heavy weather; as to rescuing the crew of a disabled ship; as to steps to be taken when a ship is on her beam ends, or in any danger or difficulty; or if disabled or unmanageable and on a lee shore; heaving a keel out, &c. He must explain the mode of procedure when placing ship in dry dock, directing repairs, and if putting in to port in distress with damage to cargo and ship. He must possess a sufficient knowledge of what he is required to do by law, as to entry and discharge, and the management of his crew, and as to penalties, and entries to be made in the official log, and a knowledge of the measures for preventing and checking the outbreak of scurvy on board ship, and the law as to load line marks, and the entries and reports to be made respecting them. He will be questioned as to his knowledge of invoices, charter party, bills-of-lading, Lloyd's agent, and as to the nature of bottomry, also bills-of-exchange, surveys, averages, &c., and must answer any other questions of a like nature appertaining to the management of a ship which the Examiners may consider it necessary to touch upon. He will also be required to give satisfactory answers as to his knowledge of the additional subjects (applying more particularly to steam-ships) which are specified in the Rules of Examination for Masters' Certificates of Competency for Foreign-going Steam-ships.

*Fore and Aft  
rigged ships.*

**Certificates for Fore and Aft rigged Vessels.**

56. Certificates for the grades of Master, First Mate, Only Mate, and Second Mate, on which the words "for Fore and Aft rigg'd vessels only" will be written, will be issued to Candidates who have not complied with the regulation which requires them to have served at least one year in square-rigged sailing vessels, or who prove in course of examination that they are ignorant of the management of square-rigged ships.

57. A certificate "for Fore and Aft rigg'd vessels only" will not entitle the possessor to act in a capacity for which a certificate is required in square-rigged vessels, amongst which are classed full-rigged ships, barques, brig, barquentines, brigantines, and steam-ships carrying square sails.

58. A Candidate possessing a certificate "for Fore and Aft rigg'd vessels only," and desiring to obtain an ordinary certificate of the same grade, must prove that he has served at sea at least one year in a square-rigged sailing vessel, and will be re-examined both in navigation and seamanship.

*Foreign-going  
Steam-Ships.*

**Qualifications for Certificates of Competency for Foreign-going Steam-ships only.**

59. Certificates of Competency will be issued, subject to the examinations hereinafter described, for officers who have served in steam-ships, and who, owing to absence of service in square-rigged sailing ships, cannot under the

\* See Appendices G and M.

† See Appendix F.

existing regulations obtain Certificates of Competency to act in the capacity of Masters or Mates of square-rigged ships.

60. These certificates will entitle the holders to go to sea as Masters and Mates of foreign-going steam-ships, but will not entitle the holders to go to sea as Masters or Mates of foreign-going sailing ships.

61. There will be no distinction in respect of "Fore and Aft" and "Square-rigged" steam-ships.

62. EXAMINATION IN COLOURS.—All Candidates for Certificates of Competency must pass the examination in Colours.

63. A SECOND MATE must be not less than seventeen years of age, and must have been four years at sea. *See also para. 11.*

On and after the 1st April 1890, no candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.

64. IN NAVIGATION, &c.—He must write a legible hand, and will be required to give in writing (*vide supplementary vivā voce test, page 39*) definitions of various astronomical and other terms used in navigation.\* He must have a competent knowledge of the first five rules of arithmetic, and the use of logarithms. He must be able to work a day's work complete, correcting the courses for deviation, leeway, and variation. He will be required to find the latitude by meridian altitude of the sun, and the difference of longitude from a given departure by a parallel sailing; also to find the course and distance from one position to another by Mercator's method. He will be required to find the time of high water at a given port, to observe and calculate the amplitude of the sun, and to find the error of the ship's compass therefrom, and also the deviation, the variation being given. He must be able to find the daily rate of the chronometer from error observed, and to find the longitude from altitude of the sun by the usual methods. He must understand the use of the sextant with its adjustments, and be able to observe with it, find the index error by the horizon, and read *off* and *on* the arc.† He must also pass a satisfactory examination in the International Code of Signals.‡

65. IN SEAMANSHIP, &c.—He must give satisfactory answers as to the standing and running rigging of steam-ships; as to bending, unbending, setting, reefing, taking in and furling sail; as to sending masts and yards up and down, &c., &c., as to seeing everything in readiness and clear for getting under way, and as to the precautions to be then observed with regard to engines, propellers, &c.; as to the management of a steam-ship when under canvas; and of a ship's boat in heavy weather, and as to dunnaging and stowing cargo, &c. He must have a thorough knowledge of the rule of the road as regards both steamers and sailing vessels, their regulation lights, and fog, and sound signals,§ and be able to describe the signals of distress and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals.|| He must be able to mark and use the lead and log lines. He must also understand the construction, use, and action of the sluices, and of the water-ballast tanks, engine-room, telegraph, &c.; the use and management of the rocket apparatus in the event of his vessel being stranded, and other questions of a like nature, appertaining to the duties of the Second Mate of a steam-ship, which the Examiners may think necessary to put to him.

66. AN ONLY AND FIRST MATE.—An Only Mate <sup>Only and First Mate.</sup> must be not less than nineteen years of age, and must have served five years at sea. A First Mate must be nineteen years of age, and must have served five years at sea, of which

\* See Appendix A.      † See Appendix B.      ‡ See Appendix C.  
§ See Appendix D.      || See Appendix E.

one year must have been as Second or Only Mate of a Foreign-going Steam-ship. *See also paras. 11, 16 and 27.*

On and after the 1st April 1890, no candidate will be allowed to be examined unless he has served at sea two years within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.

67. IN NAVIGATION.—In addition to the qualifications required for a Second Mate, an Only or First Mate must be able to find the true bearing of the sun and the error of the ship's compass from an observed azimuth of the sun both from an altitude and also from the "Time Azimuth Tables," and with the variation given compute the deviation; to find the latitude from a single altitude of the sun off the meridian, and to be able to use and adjust the sextant,\* and to find the index error by the sun; and also to ascertain the true bearing of the sun, &c., and the ship's position by Sumner's Method by Projection.† He must also be conversant with the use of Mercator's Chart, and be able to find on either a "true" or "magnetic" chart,‡ the course to steer and the distance from one given position to another; and find the ship's position on the chart from cross bearings of two objects; from two bearings of the same object, the course and distance run between taking the bearings being given; and the distance of ship from the object at the time of taking the second bearing. He must also understand how to keep a ship's Log Book. He will also be required to answer certain questions in writing (*and orally*) relating to cyclones or revolving storms.

68. IN SEAMANSHIP.—In addition to the qualifications required for a Second Mate, a more extensive knowledge of seamanship will be required, as to shifting large spars, rigging sheers, taking lower masts in and out, how to moor and unmoor ship and to keep a clear anchor, to carry out an anchor; how to manage a steam-ship in stormy weather, and how to rig purchases for getting heavy weights, anchors, machinery, &c., in and out. He must give satisfactory answers as to the ventilation of holds, and the stowage of explosives. He must be able to describe the effects of the screw race upon the rudder; and the effect produced on the direction of the head of the ship by going [ahead] [astern] with a [right] [left] handed screw when the rudder is [ported] [starboarded]. He must also know how to rig a sea anchor, and what means to apply to keep a steamer with machinery disabled out of the trough of the sea, and lessen her lee drift. How to turn a steam-ship short round; how to get cast of deep sea lead in heavy weather, and other questions of a like nature appertaining to the duties of an Only and First Mate of a steam-ship, which the Examiners may think necessary to put to him.

69. A MASTER—Must be not less than twenty-one years of age, and have been six years at sea, of which one year must have been as First or Only Mate in a Foreign-going Steam-ship, and one year as Second or Only Mate; or he must have been six and-a-half years at sea, of which two and-a-half years must have been as Second or Only Mate in a Foreign-going Steam-ship, during the last twelve months of which he must have been in possession of a First Mate's Certificate. *See also paras. 11, 12 and 17.*

On and after the 1st April 1890, no candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.

70. IN NAVIGATION.—In addition to the qualification required for a Second, Only, and First Mate, he must be able

\* See Appendix B.    † See Appendix I.    ‡ See Appendix F.  
Also page 21 foot-note.‡

to compute the latitude from the meridian altitude of a star, he must be able to find the magnetic bearing from equidistant compass bearings of any fixed object when at sea, and compute the deviation therefrom. He must construct a deviation curve upon a "Napier's" diagram which will be furnished by the Examiner, and understand the practical application of the same, and give satisfactory written (*and oral*) answers to certain practical questions on the effect of the ship's iron upon the compasses, the method of determining the deviation, and compensating same by magnets and soft iron.\* He will be required to find the course to steer by compass in order to counteract the effect of a given current, and find the distance the ship will make good towards a given point in a certain time, and to work out practically the correction to apply to soundings taken at a given time and place, to compare with the depth marked on the chart.†

71. IN SEAMANSHIP, &c.—In addition to the qualifications required of a Second, Only, and First Mate, he must be able to construct rafts and jury rudders suitable for a screw steam-ship. He will be examined as to his resources for the preservation of the ship's crew in the event of wreck; as to the management of steam-ships in heavy weather; as to rescuing the crew of a disabled ship; as to steps to be taken when a ship is on her beam ends; or if disabled and on a lee shore. How to use steam appliances in the event of fire, and the best arrangement for towing vessels under different circumstances, placing ship in dry dock, directing repairs, and the mode of procedure if putting into port in distress with damage to cargo and ship. He must possess a sufficient knowledge of what he is required to do by law, as to entry and discharge, and the management of his crew, and as to penalties and entries to be made in the official log, and a knowledge of the measures for preventing and checking the outbreak of scurvy on board ship, and the law as to load line marks, and the entries and reports to be made respecting them. He will be questioned as to his knowledge of invoices, charter-party, bills-of-lading, Lloyd's agent, and as to the nature of bottomry; also bills-of-exchange, surveys, averages, &c., and answer any other questions of a like nature, appertaining to the management of a steam-ship, which the Examiners may consider it necessary to touch upon.

#### Service in Royal Navy.

72. Officers of the Royal Navy are at liberty to apply for Certificates of service and to be examined for Certificates of Competency in the Mercantile Marine, but they must submit their applications in the manner directed by the Lords Commissioners of the Admiralty.

73. Officers of the Royal Navy desirous of being examined for Certificates of Competency in the Mercantile Marine will be required to prove the following service, of which twelve months must have been sea service under sail alone.

74. For Second Mate.—A Candidate must produce satisfactory evidence of four years' service at sea, or that he has attained the rank of acting Sub-Lieutenant.

75. For Only Mate.—A Candidate must prove five years' service at sea.

76. For First Mate or Masters.—A Candidate must show that he has attained the rank of Sub-Lieutenant, or Navigating Sub-Lieutenant.

#### Voluntary Examination in the Laws of the Deviation of the Compasses of Iron Ships.

77. Any Master or Mate who wishes to pass a voluntary examination in the Syllabus\* of examination on the Laws of the Deviation of the Compasses of an Iron Ship, &c., can at any time be examined upon filling up the form of application, and the payment to the Port Officer of the prescribed fee. If the candidate passes the examination successfully, an endorsement to that effect will be duly made upon the Master's or Mate's Certificate held by him.

*Voluntary Examination of Masters and Mates in the Syllabus.*

\* See Appendices G and M.    † See Appendix F.    ‡ See Appendix A.

**Failure.**Re-examination  
in case of failure

78. In all cases of failure the Candidate must be examined *de novo*. If a Candidate fails in *Seamanship* he will not be re-examined until after a lapse of SIX MONTHS. Whether the whole or part of this period must be served at sea must depend upon the subjects in *Seamanship* in which the Candidate failed, but what amount (if any) of sea service will be required will be left to the discretion of the Port Officer, subject, however, to revision by the Government, should they see fit.

79. The Examiners in making out their report on Form Exn. 14 should state what amount (if any) of further sea service the Candidate must perform, and they should also insert this information under Division H. in Form Exn. 2.\*

80. If he fails three times in *Navigation* he will not be re-examined until after a lapse of THREE MONTHS from the date of the *last failure*.

Certificate of  
lower grade.

81. If a Candidate has failed in his Examination, but the subjects in which he has failed are not included in the subjects required for a Certificate of a lower grade, he may, if he desires it, receive a Certificate of such lower grade.

82. No part, however, of the fee he has paid will be returned to him, and on presenting himself, when entitled, for re-examination for the higher grade of Certificate he will be required to pay a further full fee.

83. If a Candidate fails for bad spelling or writing, he will not be re-examined until after a lapse of at least three months.

84. If a Candidate fails in his examination for an ordinary Certificate, he may, if qualified, and upon payment of another fee, &c., be examined for a Certificate of Competency for Foreign-going Steam-ships without waiting the usual time after failure.

**Fees.**Fees to be paid  
by applicants for  
examination,  
s. 133.

85. Candidates for examination, in making their application on Form Exn. 2, will be required to pay the examination fee before any step is taken, whether by enquiring into their services or testing their qualifications, &c. Should it be found that their service is not sufficient to entitle them to be examined, or should their testimonials be unsatisfactory, or should they from any other cause, except failure to pass the colour tests, not be examined, no part of the fee will be returned to them, but when they have fulfilled the requisite service, or are able to produce satisfactory testimonials, as the case may be, they will be allowed to again present themselves for examination for a Certificate of the same grade without paying any further fee.

86. The fee for examination must be paid to the Port Officer. In any case in which a Candidate offers money to any other officer, and in any place but in the Port office, the Candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be again examined for twelve months.

87. If a Candidate fail in his examination *no part of the fee will be returned to him*.

88. The fees are as follow:—

**FOR "FOREIGN-GOING SAILING AND STEAM SHIPS."**

	Rs.
Second Mate     ...     ...	12
First and Only Mate, if previously possessing an inferior certificate, either granted by the Board of Trade, or by the Government of a British Possession under section 8 of the "Merchant Shipping (Colonial) Act, 1869"	6
If not     ...     ...	12
Master     ...     ...	24
Where a Candidate is in possession of a Certi- ficate for Fore and Aft rigged Vessels, for an Ordinary or Steam-ship Certificate of the same grade     ...     ...	12

\* See Appendix H.

## FOR "VOLUNTARY EXAMINATION IN STEAM."

	Rs.
Mate (Only or First) ...	12
Master ...	12

FOR "VOLUNTARY EXAMINATION IN DEVIATION OF  
THE COMPASS."

	Rs.
Mate (Second, Only or First) ...	12
Master ...	12.

## GENERAL.

89. Certificates of Competency shall be made and issued by the Government in the forms hereunto annexed.

90. Every Certificate of Competency shall be made in duplicate, and one copy shall be delivered to the person entitled to the Certificate and the other shall be kept and recorded by the Port Officer of Calcutta.

90A. No application from the holder of a certificate granted by the Government of any other British Possession or by the Board of Trade to be examined for a certificate of the same legal value shall be entertained.

General Instructions to Examiners and Candidates. Prohibited books and papers.

91. All instruments necessary for use in the examinations are supplied by the Government.

92. Before commencing the examination, the tables or desks must be cleared of all scraps of paper, or books that are not used in the examination, and care should be taken that the candidates do not bring into the examination room any book, paper, document, or memoranda of any description whatever. No person whatever should be allowed in the room during the time of examination, but those whose duties require them to be present.

93. No instructors will be allowed on the premises.

94. Candidates will under no pretence whatever be allowed to leave the premises while the examination is proceeding. If a Candidate has occasion to visit the retiring room he will only be allowed to do so on the completion of the paper on which he may be engaged, when he will be required to enter in a book, kept for the purpose, the exact time of his leaving and returning to the examination room. When only a few Candidates are under examination, two persons will not be allowed to leave the room at the same time.

95. Candidates should be so placed as to prevent one copying from the other, and no communication whatever between the Candidates should be allowed. Position of Candidates at examination.

96. If any blotting paper is allowed it should be black; Blotting paper. and when the first examination paper is issued each Candidate should be furnished with a piece which should be returned to the Examiner upon the completion of the last paper.

97. The examination papers should be issued to the Candidates in half sheets only, and one at a time. This will prevent a Candidate from spreading out the sheets on the table in an apparently careless manner, but so as to enable his nearest neighbour to look over and copy, or examine the problems. It will also enable the Examiner to look over and report upon the work on one half sheet, while the Candidate is at work upon another, and so on. When the errors are not too numerous, or when they are not from ignorance of the subject, the incorrect problems may be returned to the Candidate for correction, but in no case should the errors be pointed out by the Examiner, neither should any marks be made on the correct work of the problem, which would at once indicate how far or to what extent the work is correct. Should the problems be returned to the Examiner the second time incorrect, this would be a failure; and as the time allowed is considered ample for working out the papers carefully, this rule is expected to be strictly observed.

98. When from the large number of the Candidates, it may be found impossible to look over the work, on the day of examination during the office hours, an hour in the morning of the following day may be allotted for the purpose of correcting the problems, but in no case should a Candidate have his problem returned to him for correction after he has made the second attempt. In certain cases problems may be corrected on morning following examination day.

Re. Exn. 4A

99. The paper (Exn. 4A) is only for those Candidates who present themselves for examination for the first time. It is intended not only to ensure on the part of the Candidate a knowledge of the meaning of a variety of terms of great use to the Navigator respecting which much ignorance exists at present, but at the same time to test his handwriting and spelling.

100. In using this paper, the Examiner will place a mark against the numbers of the particular questions which he selects for answers, and not less than ten questions should be selected. The Candidate will then write against the questions so marked his definition of the terms in a clear and legible hand, so as to prevent the possibility of any letter being mistaken. Attention should be paid to the spelling and writing of all grades of Candidates. The *supplementary viva voce* test should also be applied as usual.

Re-questions  
on Deviation of  
the Compass.  
(Exn. 7,  
Appendix G.)

101. In the questions on Deviation of the Compass (Exn. 7, Appendix G) the Examiner should indicate by a mark against at least twelve of the questions for answers, and those indicated must be correctly answered. The selected questions should be varied frequently, and no two Candidates should have precisely the same questions. The Candidate should be furnished with sheets of blank ruled paper which is supplied for that purpose with instructions that he is to write only on one side of the paper, and to answer each of the questions against which a mark is placed in a clear and legible hand, and to commence each answer by writing down the number of the question to which it relates in the margin left for that purpose. In answering question 19, besides giving a full explanation in writing, of the *tentative method*\* of compass adjustment (accompanied by the usual *supplementary viva voce* test), the Candidates should be required to illustrate by diagrams how the poles of the magnets are placed with regard to the compass needle for correcting the semi-circular deviation, as well as the heeling error, and also how the soft iron should be placed for correcting the quadrantal deviation, or the Candidate may be tested by "Beall's Compass Deviascope," in which case it will not be necessary for him to give the written answer and sketches.

*Viva voce*  
examination.

102. In the *viva voce* examination a reasonable time should be allowed for the Candidate to give his answers. No assistance should be given or leading question put.

Adjustment of  
sextant. §

103. Particular attention should be paid to the adjustments of the sextant, and the written answers should be given on the ruled paper in the same manner as the answers to the questions on Exn. 7, and the *supplementary viva voce* test applied as usual. Every Candidate should have a practical knowledge of what is known as the first three adjustments, and be able to read correctly *off* the arc, a supposed index error to be given by the Examiner as additive, as well as reading *on* the arc in the usual way.

Minor correc-  
tions.

104. All outstanding or minor corrections should appear in the margin of each problem paper; also on the chart papers Exn. 9C and Exn. 9D; and unless all these corrections appear on the papers of the Candidate they will not be considered complete.

Examination  
to commence  
with that for  
Second Mate.  
Problems re-  
quired as tests.

105. In every case the Examination, whether for Only Mate, First Mate, or Master, is to commence with the problems for Second Mate.

106. Examiners should bear in mind that the problems to be performed are required as tests, and for the purposes of an Examination, and not for sea-going or practical purposes alone.

107. The Candidates will be allowed to work out the various problems according to the method and the tables they have been accustomed to use.

#### Time allowed for Problems and Writings.

Time allowed  
for working  
problems.

108. Candidates for Second Mates' Certificates of Competency must complete the whole of their Examination in Navigation in *eight hours*, including the time allowed for writing the definitions (Exn. 4a), the paper on the adjustment of the sextant, and the correction of *all* errors and oversights; but

\* See Appendix M.

the nautical problems on Forms "Exn. 4" and "Exn. 5" must be completed within *six hours*, and without the Candidates leaving the premises during that period.

109. *Candidates for Only and First Mates' Certificates* must complete the whole of their examination in Navigation in *twelve and-a-half hours*,\* including the time allowed for the papers on the sextant; the chart; cyclones or revolving storms; and for the correction of *all errors and oversights*; but the nautical problems on Forms "Exn. 4," "Exn. 5," and "Exn. 6" must be completed within *six hours*, and without the Candidates leaving the premises during that period.

110. *Candidates for Certificates as Masters' Ordinary*, must complete the whole of their examination in Navigation in *fifteen hours*; including the time allowed for the papers on the sextant; the chart; compass deviation; cyclones or revolving storms; and for the correction of *all errors and oversights*; but the problems on Forms "Exn. 4," "Exn. 5," and "Exn. 6," must be completed within *six hours*, and without the Candidates leaving the premises during that period.

111. *Candidates after finishing the problems required of the respective grades* on the first day of examination should proceed, until the end of that day, with such subjects as the definitions, sextant, chart, and Question 19 of Form "Exn. 7."

112. *The Sunner Problem (Exn. 6a)* must on no account be given out to any of the grades on the first day of the examination, but should be the commencement of the Candidate's work on the second day, and on completion of this problem the Candidates for Masters' Certificates should proceed with the problems on paper "Exn. 7."

113. *Candidates for Foreign-going Steam-ship Certificates of Competency* will be allowed the same amount of time to perform their navigation, &c., as hereinbefore laid down for the respective grades for the Ordinary Foreign-going Certificates.

114. *Deviation of the Compass*.—A period not exceeding eleven hours will be allowed to Candidates for the completion of the whole of the examination in the Syllabus, including the correction of all errors and oversights in both the problems and writings.

115. Punctually at the expiration of the prescribed time all the papers should be called up, whether completed or not, and if not completed, the Candidate will be declared to have failed, unless the Port Officer or the Examiner see fit to lengthen the period in any special case. If, however, the period is lengthened in any case, the special circumstances of that case, and the reasons for lengthening the period, together with the time allowed, must be reported to the Government by the Examiners, in the column for "remarks" on the Form Exn. 14. It should be noted that the periods prescribed in the foregoing paragraphs are not intended to include the time occupied by the *viva voce* part of the examination.

116. It is anticipated that but few of the Candidates for Certificates of Competency for any of the foregoing grades will require the whole of the time herein allowed for completing their Examination in Navigation; and ample time has been prescribed so that Candidates may perform their work in a careful, clear, and legible manner, and to the entire satisfaction of the Examiners.

#### *Degree of Precision required in the Solution of the Problems.*

117. In order to prevent any misapprehension as to the degree of precision required by the Regulations in working out the various problems in the Examinations for Masters' and Mates' Certificates, the attention of Examiners and Candidates is particularly directed to the following Instructions:—

(a.) Candidates are expected to work out their answers to all problems within or not to exceed a margin of *one mile of position* from a correct result (e.g., in problems where the answer required is a latitude, longitude, or distance), excepting in finding the

\* A Candidate other than Second Mate who may not previously have passed an examination may be allowed the time occupied in writing his definitions on Exn. 4a, in addition to the above.

ship's position by "Sumner's" method, where a margin of  $2\frac{1}{2}$  miles will be allowed.

- (b.) In such problems as the "Amplitude" and "Alt-Azimuth," where the bearings, deviations, &c., only are required, a margin of 2', or 3', from a correct result will be sufficiently accurate.
- (c.) In no problem is the Candidate for an "ordinary" Certificate required by the Regulations to correct for *second differences* in taking out the quantities from the Nautical Almanac.
- (d.) In solving the "Time Azimuth" problem, an answer not exceeding half a degree from the exact result will be sufficiently near. But in all cases the actual latitude, declination, and time used, together with the exact bearing (from the North or South) as given in the tables, must be clearly shown by the Candidate on his papers.
- (e.) In interpolating for the correct deviation to be applied in solving the Chart question, Papers "Exn. 9 C." and "Exn. 9 D," it will usually be sufficiently near if the Candidate works throughout with the nearest degree of deviation taken from the "Deviation Card," and even in cases where the deviations may vary but little, the nearest half degree used throughout will be sufficiently precise, and will at the same time prove whether the Candidate understands the method of arriving at the amount of, and applying, deviations. It is not necessary that the Candidate should waste his time in solving the course to *odd minutes* as is sometimes done.
- (f.) In calculating the correction to apply to the Soundings. Question 5 of Paper "Exn. 9 D," the Candidate is not required to work out to the exact inch, as is sometimes done. It will be sufficiently near if he brings his answer within half a foot or so of a precise result.

It must be clearly understood in reading the foregoing Instructions that it is always provided the work of the Candidate is correct in principle.

*Supplementary vivâ voce Examination on written Papers.*

118. An impression prevails in regard to the examination of Masters and Mates, that so long as a Candidate can commit to paper correct answers to the various questions requiring written answers (*e.g.*, *Forms Exn. 4a, Exn. 7, Exn. 9a, Exn. 9c, Exn. 32, 70, &c.*), no matter how indicative the answers may be of their having been learnt off by rote *only*, the duty and responsibility of the Examiners are at an end, and that they have no power or authority to reject a Candidate should his written answers be correct.

119. Lest, therefore, such an impression should prevail, Candidates for Certificates of Competency should bear in mind that they are not only expected to give correct written answers, which may merely be learnt off by rote, but they are expected to possess an intelligent knowledge of the various subjects prescribed in the Regulations, particularly as regards the important subject of the Deviation of the Compass.

120. This result may be easily attained by the Examiner putting a few *vivâ voce* questions to the Candidate as the papers are brought up for inspection, or at any subsequent time if more convenient. The oral questions (suggested by the printed questions and the answers given) should be such that the Examiner may satisfy himself that the candidate possesses a real knowledge of what he has written, and should be confined strictly to the subjects of the printed questions. Should the candidate then exhibit ignorance of the subjects, the Examiner (who is in a position to judge of the real knowledge the man before him possesses) should deal with him at his discretion, notwithstanding that the candidate may have written all the answers correctly by rote.

121. When an Examiner finds it necessary to fail a Candidate in this *supplementary vivâ voce* test, a memorandum containing the particulars of the points on which the candidate was ignorant, *i.e.*, the *identical questions and the identical*

*answers given*, must in each case be attached to his examination papers, when forwarded in the usual course to the Port Officer, or the particulars may be set forth by the Examiner in the margins of the candidate's papers in red ink.

122. If the Candidate passes, he will receive the Form Form Exn. 16  
Completion of  
Exn. 16 upon which the Government, will issue the Certificate to the candidate, whose testimonials, &c., will be returned at the same time.

#### Special Notice to Candidates.

123. The attention of Candidates is specially called to the following Regulations :—

124. Candidates are required to appear at the examination room punctually at the time appointed.

125. Candidates are prohibited from bringing into the examination-room books, paper, or memoranda of any kind whatever. The slightest infringement of this regulation will subject the offender to all the penalties of a failure, and he will not be allowed to present himself for re-examination for a period of three months.

126. In the event of any Candidate being detected in defacing, blotting, writing in, or otherwise injuring any book or books belonging to the Government, the papers of such Candidate will be detained until the book or books so defaced be replaced by him. He will not, however, be at liberty to remove the damaged book, which will still remain the property of the Government.

127. In the event of any Candidate being discovered referring to any book or memoranda, copying from another, or affording any assistance or giving any information to another, or communicating in any way with another, during the time of examination or copying any part of the problems for the purpose of taking out of the Examination rooms, he will subject himself to all the penalties of a failure, and he will not be allowed to be examined for a period of six months.

128. No Candidate will be allowed to work out his problems on a slate or on waste paper.

129. No Candidate will be permitted to leave the room until he has given up the paper on which he is engaged.

130. Candidates will find it more convenient both here and at sea, to correct the declination and other elements from the Nautical Almanac by the "hourly differences," which have been given in that work in order to facilitate such calculations; they will thereby render themselves independent of any proportional or logarithmic table for such purpose.

131. The corrections by inspection from tables given in some of the works on Navigation will not be allowed (*see* Tables IX, XI and XXI in Norie's Epitome, &c.); every correction must appear on the papers of the Candidates.

132. Any candidate who may be guilty of insolence to the Examiner or of other misconduct will render himself liable to the postponement of his examination, or, if he has passed, to the detention of his Certificate for such period as the Government may direct.

133. For rules as to amount of time allowed to perform the work, *see* page 36.

#### Masters' and Mates' Voluntary Examinations in Steam.

134. These examinations are limited to Masters and First or Only Mates who are possessed of or entitled to Certificates of Competency, and are provided for the purpose of giving them an opportunity of undergoing a voluntary examination as to their practical knowledge of the use and working of the steam engine. They are conducted under the superintendence of the Port Officer at such times as they may appoint for the purpose; and the Examiners are selected by the Government from the Engineer-Surveyors appointed under the Indian Steam Ships Act, 1884.

135. Any Master or Mate desiring to be examined in Steam must deliver to the Port Officer a statement in writing to that effect, upon the Form of Application (Exn. 2), and the applicant's Certificate of Competency must be delivered to the Port Officer along with his statement. If he is about to pass an examination for a Certificate of Competency at the same time, the applications should be sent in together.

136. A fee of Rs. 12 must be paid by the applicant for the examination Fee to be paid  
Conduct of  
examination,  
&c. in Steam, and the Port Officer will thereupon inform him of the time and place at which he is to attend to

be examined, and the examination will then and there proceed in the same manner as the other examinations. If the applicant fails, and has given in his Certificate, it will be at once returned to him.

Record of  
Certificate.  
Exn. 14.

Failure.

Extent of  
examination.

Where exami-  
nation to be  
conducted

Examination in  
elementary  
questions.

Answers to be  
sent to the  
Board of Trade.

Candidates re-  
ferring to  
books, &c., to  
be put down  
as failed.

In cases of  
failure Exa-  
miner to report  
questions that  
decided it.

Service on  
board Steam-  
Ship unnec-  
essary.

137. If the applicant passes, the Report (Exn. 14.) and the Certificate of Competency with the Form (Exn. 2.) will be sent to the Government; the words "*Passed in Steam*," with the date and place of examination, will then be entered on the Certificate and its counterpart, and the Certificate will be sent to the Port Officer to be delivered to the applicant in the usual manner.

138. If the applicant fails he may not present himself for re-examination until the expiration of three months from the date of failure.

139. The examination is for the most part *vivavoce*, and extends to a general knowledge of the practical use and working of the steam engine, and of the various valves, fittings, and pieces of machinery connected with it. Intricate theoretical questions on calculations of horse-power or areas of cylinders and valves, or any of the more difficult questions which appertain to steam engines and boilers, will not be asked. The examination will in fact be confined to what a Master of a steam-vessel may be called upon to perform in the case of the death, incapacity, or delinquency of the engineer.

140. Examiners are to be careful in their examinations to satisfy themselves that applicants really do know the names and uses of the various parts of engines and boilers, and their connecting pipes, valves, cocks, &c. Practical knowledge, as distinguished from theories, abstruse calculations, and book learning, is to be the test of the applicant's fitness to have his Certificate indorsed.

141. The Examiner should arrange to conduct part of the examination in the engine-room of a Steam-ship, unless from circumstances he finds it impossible to do so; and if an opportunity offer the applicant should be permitted, under the guidance of the Examiner, to start and stop the engine of some vessel which may have her steam up.

142. The Examiner, in sending in his report of examinations of Masters and Mates in steam, should state where the examination has been held.

143. Candidates will be required to give written answers to sixteen out of twenty questions taken from a book of Elementary Questions published by the Government.\* These questions will be altered from time to time without notice. The twenty questions are not to be difficult, theoretical, or book questions, but are to be such as any man of ordinary capacity ought to answer who has any "*practical knowledge of the use and working of the steam-engine*."

144. These questions, with the Candidate's answers, should be sent to the Government, with the reports, after each examination.

145. These answers will also assist in enabling the Government to decide any question that may hereafter arise in cases where it is alleged that applicants have been improperly passed, or improperly rejected.

146. The Examiners will be careful that if any Candidate refers to any book or paper or memorandum, or obtains information from another Candidate during the examination, he will be treated as having failed, will forfeit his fee, and will not be allowed to be re-examined for a period of three months.

147. The Examiners will report in the case of failure, the nature of the question or questions that decided the failure, or the point in the management of the engine in which the Candidate was deficient.

148. There is nothing in the Regulations requiring that applicants for the voluntary examination shall have served on board Steam-Ships; all that is required is that they shall have a "*practical knowledge*." Examiners will, of course, not fail to appreciate the fact, when passing applicants, that practical knowledge is best gained in the engine-room; and the examination of an Officer who does not produce official evidence of service in Steam Ships, and of experience of engines, must necessarily be more searching than in the case of one who produces evidence of such service and experience.

## APPENDIX A.

N.B.—*The Candidate is to write a short definition against so many of the following terms as may be marked with a cross by the Examiner. The Examiner will not mark less than 10. The writing should be clear, and the spelling should not be disregarded.*

1. The Equator.	25. Right Ascension.
2. The Poles.	26. Dip or Depression of the Horizon.
3. A Meridian.	27. Refraction.
4. The Ecliptic.	28. Parallax.
5. The Tropics.	29. Semi-diameter.
6. Latitude.	30. Augmentation of Moon's Semi-diameter.
7. Parallels of Latitude.	31. Observed Altitude.
8. Longitude.	32. Apparent Altitude.
9. The Visible Horizon.	33. True Altitude.
10. The Sensible Horizon.	34. Zenith Distance.
11. The Rational Horizon.	35. Vertical Circles.
12. Artificial Horizon and its use.	36. Prime Vertical.
13. True Course of a Ship.	37. Civil Time.
14. Magnetic Course.	38. Astronomical Time.
15. Compass Course.	39. Sidereal Time.
16. Variation of the Compass.	40. Mean Time.
17. Deviation of the Compass.	41. Apparent Time.
18. The Error of the Compass.	42. Equation of Time.
19. Lee Way.	43. Hour Angle of a Celestial Object.
20. Meridian Altitude of a Celestial Object.	44. Complement of an Arc or Angle.
21. Azimuth.	45. Supplement of ditto.
22. Amplitude.	
23. Declination.	
24. Polar Distance.	

## APPENDIX B.

## ADJUSTMENTS OF THE SEXTANT.

The Applicant will answer in writing, on paper which will be given him by the Examiner, all the following questions, numbering his answers with the numbers corresponding to the questions:—

Question.

1. What is the first adjustment of the sextant?
2. How do you make that adjustment?
3. What is the second adjustment?
4. Describe how you make that adjustment?
5. What is the third adjustment?
6. How would you make the third adjustment?
7. In the absence of a screw how would you proceed?
8. How would you find the index error by the horizon?
9. How is it to be applied?
10. Place the index at error of                  minutes to be added, clamp it, and leave it.

(Note.—The Examiner will see that it is correct).

11. The Examiner will then place the zero of the vernier on the arc, not near any of the marked divisions, and the Candidate will read it.

Note.—In all cases the applicants will name or otherwise point out the screws used in the various adjustments.

(The above completes the Examination of Second Mates.)

Candidates for Only Mates', First Mates', and Masters' Certificates will be required to give, in writing, replies to the following questions, *in addition* to those required of Candidates for Second Mates' Certificates as above.

1. How do you find the index error by the Sun?
2. The readings being {                  } What is the Index Error, and how do you apply it?
3. What proof have you that those measurements or angles have been taken with tolerable accuracy?

## APPENDIX C.

## EXAMINATION OF MASTERS AND MATES IN THE INTERNATIONAL CODE OF SIGNALS.

## Instructions to Examiners.

The Government desire to direct the attention of the Examiners to the principal points connected with the International Code of Signals (which is to be treated as a subject in Navigation) as to which Candidates for Examination should be questioned in order to qualify for Certificates of Competency.

The Government would recommend to the Examiners a perusal of the *Report of the Signal Committee* of 1855 (which will be found at the commencement of the Signal Book), and also the *first few pages of the Book*. The information therein given will be found sufficient to make the Examiners theoretically acquainted with the characteristics of the Code, and the advantages it claims to possess over other Codes, and will enable them to appreciate and urge upon Candidates for Examination the facilities which this System of Signalling affords for easy and rapid communication.

The "comprehensiveness" and "distinctness" of the International Code are its chief recommendations.

The form of the Hoist generally indicates the nature of the Signal made, so that an observer can at sight understand the character of the Signal he sees flying.

The annexed plate gives examples which illustrate this.

The Examinations should tend to elicit a knowledge of the distinctive features of the Code above alluded to.

With this object the Examiners should make the 2, 3, and 4 Flag Signals on the Frame board which is furnished for the purpose (*always taking care first to show the Ensign and the Code Pennant at the Gaff*),\* questioning the Candidates as to the distinguishing Forms of the respective Hoists (*See Plate annexed*), which will be indicated according as a Burgee, or a Pennant, or a Square Flag, is uppermost.

The Candidate ought to know how to find in the Signal Book the communication or the inquiry he desires to make, and how to make the Signal. The Signal to be made should *invariably* be sought for by the Candidate in the Vocabulary and Index, Part II, and never in Part I.

The Candidate ought to know how to interpret a Signal.

The Examiner should place a Signal on the Frame board and vary the Signal by showing a 2 or 3 Flag Signal, or a "Geographical" or a "Vocabulary" Signal, or the name of a Merchant Ship or a Ship of War.

The two latter signals would not of course be found in the Signal Book. The Candidate ought to point them out in the *Code List of Ships*.

A Candidate ought to be able to read off a Signal at sight, so far as to name the Flags composing the Hoist.

He ought to know the use of the Code Pennant, and of the Pennants C. and D., "Yes" and "No."

The Candidate should be practised in the use of the Spelling Table, by being made to spell his own name, or some word not in the Vocabulary of the Code.

A knowledge of the Distant Signals should be required of the Candidate, their object and the mode of signalling by the Distant Code, which will be found at the end of the Signal Book.

For this purpose two Black Balls, two Black Square Flags, and two Black Pennants will be furnished with the Frame board, and the Candidate should be required to make one or two Distant Signals, and to read off one or two made by the Examiners.

The Ball being the distinguishing symbol of the Distant Signal, any Pennants or Flags of the Code may be employed in conjunction with it, irrespective of colour. The Black Pennants and Flags are merely sent as showing best in the light background of the Frame board.

The Examiners should be careful to ascertain that the Candidate possesses a knowledge of the Distress Signals which came into operation November 1st, 1873.

#### SEMAPHORES.

A plate at the end of the Signal Book explains the method by which the arms of the Semaphore are made to represent by their position (up, down, or horizontal,) the three symbols used for Distant Signalling, viz. a Flag, a Ball, or a Pennant. Before making Signals with the Semaphore, the Black Disc with the white rim should be placed on the top of the Semaphore Mast, as it properly forms a part of the Mast itself.

The International Code is used on board Her Majesty's Ships and it has been adopted by all the principal maritime powers for their Imperial as well as for their Mercantile Navies.

*Note.*—The International Code of Signals, with the Code List, is prepared by the Registrar-General of Shipping and Seamen, and may be had of the Publishers, Messrs. Spottiswood & Co., 54, Gracechurch Street, London, and the principal Booksellers at the various ports.

The Official Mercantile Navy List and Maritime Directory published for the use of Merchants, Shipowners, Shipbrokers, and others, may be obtained in like manner, price 12s.

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\* The object of this is, of course, to distinguish the Signals from those of another Code.

## FLAGS OF THE INTERNATIONAL CODE OF SIGNALS.



N.B.—When used as the "Code Signal," this Pennant is to be hoisted under the "Ensign;" when used as the "Answering Pennant," where best seen.

<b>B</b>	<b>C</b> "YES."	<b>D</b> "NO."		<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>	<b>K</b>	<b>L</b>
<b>M</b>	<b>N</b>	<b>P</b>	<b>Q</b>	<b>R</b>	<b>S</b>	<b>T</b>	<b>U</b>	<b>V</b>	<b>W</b>	<b>X</b>

The following examples will serve to illustrate how the form of a Hoist will usually denote the nature of the Signal made:—

ONE FLAG.	TWO FLAGS.			THREE FLAGS.			FOUR FLAGS.		
	BURGEE, uppermost, "ATTENTION" Signals.	PENNANT, uppermost, "COMPASS" Signals.	SQUARE FLAG uppermost, "URGENT" Signals.	BURGEE, uppermost, GEOGRAPHICAL Signals.	PENNANT C,D,F uppermost, NATIONAL VOCABULARY.	PENNANT G uppermost, Names of MEN-OF-WAR.	SQUARE FLAG uppermost, Names of MERCHANTSHIPS.		
<b>C</b> "Yes."									
<b>D</b> "No."									

"MARLBOROUGH" "MARGO POLO,"

No. 6026.

WHAT SHIPS HAVE YOU SPOKEN?

SCREW-131 GUNS.

FALMOUTH.

CALL FOR ORDERS OFF--.

## APPENDIX D.

REGULATIONS respecting LIGHTS and FOG SIGNALS and  
STEERING and SAILING RULES ISSUED by the BOARD  
of TRADE.

## NOTICE.

The Board of Trade have had their attention drawn to the necessity of a more strict examination of applicants for Certificates of Competency in their knowledge of the regulations for preventing collisions at sea.

In order that the rule of the road at sea may be better understood, and that a uniform system of examination may prevail, the Board of Trade have issued the following catechism.

This catechism has received the approval of the Trinity House and Admiralty in England, and of the Council of the Admiralty of France.

The Board of Trade attach very great importance to a thorough knowledge of the steering and sailing rules on the part of every applicant for a Certificate of Competency, and a thorough examination on the part of the examiners.

All applicants for examination, whether for certificates as masters or mates, are to be examined as to their knowledge of the steering and sailing rules each time they present themselves for examination.

Questions suggested by the following heads of Examination are to be asked in addition to, and are not to supersede, any other questions proper and necessary to be asked by the Examiner.

The following questions need not be adhered to literally by the Examiner, and are not all to be asked; but the substance of the leading questions should be asked, and all that are asked should be satisfactorily answered, before an applicant is reported to have passed his examination. The Examiner should make such a selection of the questions as each case appears to him to require.

THOMAS GRAY,  
Assistant Secretary.

Board of Trade,  
Marine Department.

HEADS of EXAMINATION in REGULATIONS respecting LIGHTS and  
FOG SIGNALS and in the STEERING and SAILING RULES.

1. What light or lights are required by the regulations to be exhibited by sailing vessels at anchor?  
One light only, viz., a white light.
2. What light or lights are required by the regulations to be exhibited by steam-ships at anchor?  
The same as for sailing vessels.
3. Where is the anchor light to be exhibited?  
Where it can best be seen. It must of course be placed where there is the least possible chance of obstruction from spars, ropes, &c., &c.
4. To what height may the anchor light be hoisted?  
It may be exhibited at any height where it can best be seen not exceeding 20 feet above the deck.
5. What is the description of the lantern containing the anchor light required by the regulations?  
A globular lantern of not less than eight inches in diameter.
6. In what direction or directions must the anchor light show?  
It must show a clear, uniform, and unbroken light, visible all round the horizon.
7. At what distance must it be visible?  
At least one mile.
8. What is the number of lights required by the regulations to be carried by sailing ships when under weigh at night?  
Two side-lights, and to have in readiness a white light or a flare-up light to show from their stern to any vessel overtaking them.
9. Of what colour are these lights, and how are they to be placed on board the ship?  
A green light on the starboard side, and a red light on the port side.
10. What description of light must be shown from the sides of sailing vessels under weigh; and over how many points of the compass, and in what directions, and how far, are they required to show?  
Each light must be so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass; so fixed as to throw the light from right ahead to two points abaft the beam on the starboard and port sides respectively.

and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles.

11. What lights are they to carry when being towed at night ?  
The same.

12. Are the side-lights required to be fitted with screens ; and if so, of what length, and how ?

Yes on the inboard side ; at least three feet in length, measuring forward from the light. They are to be so fitted as to prevent the coloured lights from being seen across the bows.

13. What is the number of lights required by the regulations to be carried by steam-ships when under steam at night ?

Three lights, and to have in readiness a white light or flare-up light to show from their stern to any vessel overtaking them.

14. Of what colour are these lights, and how are they to be placed on board the ship ?

A white light on or in front of the foremast at a height above the hull of not less than 20 feet, and if the breadth of the ship exceeds 20 feet, then at a height above the hull not less than such breadth. A green light on the starboard side, and a red one on the port side.

15. Over how many points of the compass, in what direction, and how far, is the foremast head light of a steamer required to show ?

Over 20 points, viz., from right ahead to two points abaft the beam on both sides. It must be of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least five miles.

16. Are the side-lights required to be fitted with screens ; and if so, of what length ?

The green and red lights are to be fitted with screens on the inboard side, extending at least three feet forward from the light, as in the case of sailing vessels.

17. Over how many points of the compass, in what directions, and how far, are the coloured side-lights of steamers required to show ?

The side-lights must be so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass, on each side of the ship, i.e., from right ahead to two points abaft the beam on the starboard and port sides respectively, and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles.

18. What description of lights are steamers required by the regulations to carry when they are not under steam, but under sail only ?

Side-lights only, the same as sailing vessels.

19. What exceptional lights are to be carried by small sailing vessels in certain cases ?

Whenever, as in the case of small vessels during bad weather, the green and red side-lights cannot be fixed, these lights shall be kept on deck, on their respective sides of the vessel, ready for use ; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side, nor the red light on the starboard side.

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

20. What description of lights are pilot vessels required to carry when on their stations on pilotage duty ?

A pilot vessel, when engaged on her station on pilotage duty, shall not carry the lights required for other vessels, but shall carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

21. What description of lights are pilot vessels required to carry when not on their station on pilotage duty ?

A pilot vessel, when not engaged on her station on pilotage duty, shall carry lights similar to those of other ships.

22. What lights are open boats and fishing vessels of less than 20 tons net register required to carry when under way and not actually engaged in fishing.

Open boats and fishing vessels of less than 20 tons net registered tonnage, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the coloured side-lights ; but every such boat and vessel shall in lieu thereof have ready at hand a lantern with a green glass on the one side and a red glass on the other side, and on approaching to, or being approached by another vessel, such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side, nor the red light on the starboard side.

23. What lights are fishing vessels and fishing boats of 20 tons net register, or upwards, required to carry when under way and not actually engaged in fishing?

They must carry similar lights to those of other ships when under way.

24. What lights are steam trawlers of 20 tons gross register, or upwards, whilst actually engaged in trawling, and not being stationary, required to carry?

All steam-vessels engaged in trawling must carry either one of the two following arrangements of lights, whichever of the two may be the more convenient:—

- (a) The usual green and red side-lights, and foremast-head light, similar to those carried by other steam-ships; or
- (b) They must carry on or in front of the foremast-head, and in the same position as the white light which other steam-ships are required to carry, a lanthorn showing a white light ahead, a green light on the starboard side, and a red light on the port side; such lanthorn shall be so constructed, fitted, and arranged as to show an uniform and unbroken white light over an arc of the horizon of four points of the compass, an uniform and unbroken green light over an arc of the horizon of 10 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 10 points of the compass, and it shall be so fixed as to show the white light from right ahead to two points on the bow on each side of the ship, the green light from two points on the starboard bow to four points abaft the beam on the starboard side, and the red light from two points on the port bow to four points abaft the beam on the port side: and (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform, and unbroken light all round the horizon; the lanthorn containing such white light shall be carried lower than the lanthorn showing the green, white, and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet, nor more than 12 feet.

25. What lights are sailing trawlers whilst actually engaged in trawling, and not being stationary, required to carry?

All sailing vessels, of whatever tonnage, whilst engaged in trawling, must carry either one of the three following arrangements of lights, whichever of the three, (a), (b), or (c), may be the most convenient:—

- (a) They may carry the green and red side-lights similar to those of other sailing ships; or
- (b) They may carry on or in front of the foremast-head a lanthorn having a green glass on the starboard side and a red glass on the port side, so constructed, fitted, and arranged that the red and green do not converge, and so as to show an uniform and unbroken green light over an arc of the horizon of 12 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 12 points of the compass, and it shall be so fixed as to show the green light from right ahead to four points abaft the beam on the starboard side and the red light from right ahead to four points abaft the beam on the port side; and (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform and unbroken light all round the horizon; the lanthorn containing such white light shall be carried lower than the lanthorn showing the green and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet and not more than 12 feet; or
- (c) They may carry a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform and unbroken light all round the horizon, and visible on a dark night, with a clear atmosphere, for a distance of at least 2 miles; and also a sufficient supply of red pyrotechnic lights which shall each burn for at least 30 seconds, and shall, when so burning, be visible for the same distance under the same conditions as the white light. The white light shall be shown from sunset to sunrise, and one of the red pyrotechnic lights shall be shown on approaching, or on being approached by, another ship or vessel in sufficient time to prevent collision.

26. What lights are vessels whilst actually engaged in drift net fishing required to carry?

All vessels when engaged in fishing with drift nets shall exhibit two white lights from any part of the vessel where they can be best seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 feet and not more than 10 feet; and so that the horizontal distance between them measured in a line with the keel of the vessel shall be not less than 5 feet and not more than 10 feet. The lower of these two lights shall be the more forward, and both of them shall be of such a character and contained in lanterns of such construction as to show all round the horizon, on a dark night, with a clear atmosphere, for a distance not less than three miles.

27. What lights are vessels whilst actually engaged in line fishing required to carry?

A vessel engaged in line fishing is required to carry the same lights as a vessel engaged in drift net fishing.

28. If a vessel, when fishing, becomes stationary in consequence of her gear getting fast to a rock or other obstruction, what signal must she make?

She must show the same light, and if a fog, mist, or falling snow prevail, she must make the same fog signals as if she were at anchor.

29. What lights are fishing vessels and open boats required to exhibit when at anchor?

Between sunset and sunrise they must exhibit a white light, visible all round the horizon at a distance of at least one mile, the same as any other vessel.

30. What sound signals are fishing vessels required to make whilst engaged in fishing in thick weather?

In fog, mist, or falling snow, a drift net vessel attached to her nets, and a vessel when trawling, dredging, or fishing with any kind of drag net, and a vessel employed in line fishing with her lines out, shall at intervals of not more than two minutes make a blast with her fog-horn and ring her bell alternately.

31. May fishing vessels and open boats use flare-up lights, and if so, at what part, or parts, of the vessel should they be exhibited?

Yes. Fishing vessels and open boats may at any time use a flare-up in addition to the lights which they are by this article required to carry and show. All flare-up lights exhibited by a vessel when trawling, dredging, or fishing with any kind of drag net shall be shown at the after part of the vessel, excepting that, if the vessel is hanging by the stern to her trawl, dredge, or drag net, they shall be exhibited from the bow.

32. Do these regulations referring specially to fishing vessels and boats apply to foreign vessels, and to all parts of the world?

No, with the exception of the *first paragraph* of Article 10 of the regulations, they apply only to British vessels and boats when in the sea off the coast of Europe lying north of Cape Finisterre.

33. What lights are steam-ships required to carry when towing other ships?

A steam-ship, when towing another ship, shall, in addition to her side-lights, carry two bright white lights in a vertical line one over the other, not less than three feet apart, so as to distinguish her from other steam-ships. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light which other steamships are required to carry.

34. What light is a ship which is being overtaken by another required to show?

A ship which is being overtaken by another shall show from her stern to such last-mentioned ship a white light or a flare-up light.

35. Describe the lights and the day signals that vessels employed in laying or picking up a telegraph cable are required to carry.

A ship, whether a steam-ship or a sailing ship employed in laying or in picking up a telegraph cable, shall at night carry in the same position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line over one another, not less than six feet apart: the highest and lowest of these lights shall be red and the middle light shall be white, and they shall be of such a character that the red lights shall be visible at the same distance as the white light. By day she shall carry in a vertical line one over the other, not less than six feet apart, in front of, but not lower than her foremast-head, three shapes not less than two feet in diameter, of which the top and bottom shall be globular in shape and red in colour, and the middle one diamond in shape and white.

36. Describe the lights and the day signals that vessels which from any cause are not under command are required to carry.

A ship, whether a steam-ship or a sailing ship, which from any accident is not under command, shall at night carry, in the same

position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three red lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over the other, not less than three feet apart, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles; and shall by day carry in a vertical line, one over the other, not less than three feet apart, in front of but not lower than her foremast-head, three black balls or shapes, each two feet in diameter.

37. Are the above-mentioned ships to carry side-lights?

The above ships, when not making any way through the water, shall not carry the side-lights, but when making way shall carry them.

38. What are the previous mentioned shapes and lights intended to indicate to approaching ships?

These shapes and lights are to be taken by approaching ships as signals that the ship using them is not under command, and cannot therefore get out of the way.

39. Do these rules prevent squadrons and convoys from carrying special lights?

No. Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war, or for ships sailing under convoy.

40. What sound signals are steam-ships and sailing ships required by the regulations to be provided with?

A steam-ship shall be provided with a steam whistle or other efficient steam sound signal, so placed that the sound may not be intercepted by any obstructions, and with an efficient fog-horn to be sounded by bellows or other mechanical means, and also with an efficient bell. A sailing ship shall be provided with a similar fog-horn and bell.

41. When are these signals to be used?

In fog, mist, or falling snow, whether by day or night.

42. What sound signal is to be made by steam-ships and sailing ships when not under way?

A steam-ship and a sailing ship when not under way shall, at intervals of not more than two minutes, ring the bell.

43. What sound signal is required to be made by a steam-ship when under way?

A steam-ship under way shall make with her steam whistle, or other steam sound signal, at intervals of not more than two minutes, a prolonged blast.

44. What sound signals are required to be made by sailing ships when under way?

A sailing ship under way shall make with her fog-horn, at intervals of not more than two minutes, when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.

45. Do the regulations require ships to take any other precaution during thick weather?

Yes. Art. 13 says every ship, whether a sailing ship or steam-ship, shall, in a fog, mist, or falling snow, go at a moderate speed.

46. Is it optional for a steam-ship to make any other signals with her steam whistle?

Yes; but only to vessels in sight, i.e., not to vessels which are so obscured by fog, mist, or falling snow that they cannot be seen, though their whistles may be heard.

Art. 19 provides that in taking any course authorised or required by the regulations, a steam-ship under way may indicate that course to any other ship which she has in sight by the following signals on her steam whistle, viz.:—

One short blast to mean "I am directing my course to starboard : "

Two short blasts to mean "I am directing my course to port : "

Three short blasts to mean "I am going full speed astern."

The use of these signals is optional; but if they are used, the course of the ship must be in accordance with the signal made.

47. What precaution is to be taken by steamers approaching another vessel?

If there is risk of collision, the steamer is to slacken speed, or, if necessary, stop and reverse.

48. If you see two white lights in a vertical line one over the other, what do they denote as regards the vessel carrying them?

They denote the presence of a steamer towing with her side lights not within sight on account of distance, fog, &c.; or a vessel end on to me engaged in drift net fishing, or in line fishing, or it may be a steam trawler end on, or within 2 points of being end on, to me.

49. If you see a green, or a red, light with a white light below, what do they denote?

They denote the presence of either a sailing, or a steam, vessel engaged in trawling.

50. If you see both the green and red lights with a white light below them, what do they denote?

They denote the presence of a sailing trawler coming end on to me.

51. If you see a white light alone, what does it denote as regards the ship carrying it?

It denotes the presence of a vessel or boat at anchor; or a pilot vessel on her station; or the mast-head light of a vessel, under steam, with her side-lights not within sight on account of distance, fog, &c., or a fishing vessel stationary through her gear getting fast to some obstruction, or a sailing traveller engaged in trawling (1) under one arrangement of lights heading so that her side-lights are obscured, (2) under another arrangement from the red pyrotechnic light not having been exhibited, or it may be a light shown from the stern of a vessel which is being overtaken.

52. If you see a green or a red light without a white light, or both a green and a red light without a white light, is the vessel carrying the light or lights seen, a vessel under steam or a vessel under sail?

A vessel under sail.

53. How do you know?

Because there is no white mast-head light.

54. If you see a white light over a coloured light, is the vessel a vessel under sail or a vessel under steam?

A vessel under steam. The mast-head light denotes that the vessel is under steam.

[The Examiner will then take one model of a vessel, which he will place on the table, and call it A. He will then take the mast or stand with a white and a red ball on it, and place it at the other end of the table and call it B.]

The Examiner should be careful that the model of one vessel only is used when the questions numbered 55 to 60 are asked.]

55. A is a steamer going north, seeing a white light and red light right ahead at B. Are A and the vessel B showing the two lights meeting end on or nearly end on, or is B passing A, or is B crossing the path of A, and in what direction, and how do you know?

Passing to port, because if I see a red light ahead, I know that the head of the vessel carrying that red light must be pointing away in some direction to my own port or left hand. The ship showing the red light has her port or left side more or less open to A.

56. If A is going north, within what points of the compass must the vessel B showing the white and red lights be steering?

B must be going from a little W. of S. to W.N.W.

57. How do you know this?

Because the screens being properly fitted, I could not see the red light of B at all with the vessel's head in any other direction.

58. A is a steamer going north, and seeing a white and green light ahead. Are A and B meeting, or is B passing A, or is B crossing the course of A, and in what direction; and how do you know?

B is passing to starboard of A, because if I see a green light ahead, I know that the head of the vessel carrying that green light must be pointing away in some direction to my starboard or right hand. The ship showing the green light has her right or starboard side more or less open to me.

59. As A is going north, within what points of the compass must the vessel showing the white and green lights be steering?

B must be going from a little E. of South to E.N.E.

60. How do you know?

Because the screens being properly fitted, I cannot see the green light at all with the vessel's head in any other direction.

61. If a steamer A sees the three lights of another steamer B ahead or nearly ahead, are the two steamers meeting, passing, or crossing?

Meeting end on, or nearly end on.

62. Do the regulations expressly require the course of a ship to be altered to starboard in any case; and if so, when?

Yes; in the case of two steamers meeting end on, or nearly end on.

63. Do they expressly require the course of a ship to be altered to starboard in any other case; and if so, in what other?

No. It is not in any other case expressly required by the regulations.

[The Examiner should see that the candidate puts the models in the position indicated by the question 64, and following.]

64. If a steamer A sees another steamer's red light B on her own starboard side, are the steamers meeting, passing, or crossing; and how do you know?

Crossing, because the red light of one is opposed to the green light of the other ; and whenever a green light is opposed to a red light, or a red light to a green light, the ships carrying the lights are crossing ships.

65. Is A to stand on ; and if not, why not ?

A has the other vessel B on her own starboard side. A knows she is crossing the course of B, because she sees the red light of B on her (A's) own starboard side. A also knows she must get out of the way of B, because Article 16 expressly requires that the steamer that has the other on her own starboard side shall keep out of the way of the other.

66. Is A to starboard or to port in such a case ?

A must do what is right so as to get herself out of the way of B : it is generally preferable to pass under a ship's stern rather than attempt to cross her bows, but it depends entirely on the position and relative speed of the two ships, and therefore the regulations wisely leave the giving way ship to get out of the way in any manner that may be most desirable, so always that she does get out of the way.

67. If A gets into collision by porting, will it be because she is acting on any rule ?

No ; the rule does not require her either to port or to starboard. If she ports, and gets into collision by porting, it is not the fault of any rule.

68. If a steamer A sees the green light of another steamer B on her own (A's own) port bow, are the two steamers meeting, passing, or crossing ; and how do you know ?

Crossing, because the green light of one ship is shown to the red light of the other.

69. What is A to do, and why ?

By the rule contained in Article 22 of the Regulations, A is required to keep her course, subject only to the qualification that due regard must be had to all dangers of navigation ; and that due regard must also be had to any special circumstances which may exist in any particular case rendering a departure from that rule necessary in order to avoid immediate danger. The crossing ship B on A's port side must get out of the way of A, because A is on B's starboard side.

70. A, a steamer, sees the green light of another steamer, B, a point on her A's port bow. Is there any regulation requiring A to port in such a case ; and if so, where is it to be found ?

There is not any.

71. Are steam-ships to get out of the way of sailing ships ?

If a steamer and a sailing ship are proceeding in such direction as to involve risk of collision, the steamer is to get out of the way of the sailing ship, unless the sailing ship is overtaking the steamer.

72. What is to be done by A, whether a steamer or a sailing ship, if overtaking B ?

A is to keep out of the way of B.

73. When the by rules one of two ships is required to keep out of the way of the other, what is the other to do ?

To keep her course. This is absolutely necessary to enable the commander of the ship required by the regulations to keep out of the way, to act with decision and promptitude, which he cannot possibly, unless he knows what the other vessel is going to do.

74. Is there any qualification or exception to this ?

Yes. Due regard must be had to all dangers of navigation, and to any special circumstances which may exist in any particular case, and require a departure from the regulations to avoid immediate danger.

75. Is there any general direction in the steering and sailing rules ; and if so, what is it ?

Yes, it is this : that nothing in the rules shall exonerate any ship, or the owner, master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

76. Can you repeat article ( — ) of the regulations, I refer to the article containing the rule for ( — ) ?

[The Examiner should repeat this question, naming a different article each time.]

77. What does the Act of Parliament provide as to the obligation of owners and masters in obeying the regulations respecting lights, fog signals, and steering and sailing ?

Section 27 of "the Merchant Shipping Act Amendment Act, 1862," provides that owners and masters shall be bound to obey the regulations, and it also provides that in case of wilful default

shall carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

A pilot vessel, when not engaged on her station on pilotage duty, shall carry lights similar to those of other ships.

Art. 10. Open boats and fishing vessels of less than 20 tons net registered tonnage, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the coloured side-lights; but every such boat and vessel shall in lieu thereof have ready at hand a lantern with a green glass on the one side and a red glass on the other side, and on approaching to, or being approached by another vessel, such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side, nor the red light on the starboard side.

The following portion of this article applies only to fishing vessels and boats when in the sea off the coast of Europe lying north of Cape Finisterre:—

- (a) All fishing vessels and fishing boats of 20 tons net registered tonnage, or upwards, when under way and when not required by the following regulations in this article to carry and show the lights therein named, shall carry and show the same lights as other vessels under way.
- (b) All vessels when engaged in fishing with drift nets shall exhibit two white lights from any part of the vessel where they can be best seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 feet and not more than 10 feet; and so that the horizontal distance between them measured in a line with the keel of the vessel shall be not less than five feet, and not more than 10 feet. The lower of these two lights shall be the more forward, and both of them shall be of such a character, and contained in lanterns of such construction as to show all round the horizon, on a dark night with a clear atmosphere, for a distance of not less than three miles.
- (c) A vessel employed in line fishing with her lines out shall carry the same lights as a vessel when engaged in fishing with drift nets.
- (d) If a vessel when fishing becomes stationary in consequence of her gear getting fast to a rock or other obstruction, she shall show the light and make the fog signal for a vessel at anchor.
- (e) Fishing vessels and open boats may at any time use a flare-up in addition to the lights which they are by this Article required to carry and show. All flare-up lights exhibited by a vessel when trawling, dredging, or fishing with any kind of drag net shall be shown at the after part of the vessel, excepting that, if the vessel is hanging by the stern to her trawl, dredge, or drag net, they shall be exhibited from the bow.
- (f) Every fishing vessel and every open boat when at anchor between sunset and sunrise shall exhibit a white light visible all round the horizon at a distance of at least one mile.
- (g) In fog, mist, or falling snow, a drift net vessel attached to her nets and a vessel when trawling, dredging, or fishing with any kind of drag net, and a vessel employed in line fishing with her lines out, shall at intervals of not more than two minutes make a blast with her fog-horn and ring her bell alternately.

Art. 11. A ship which is being overtaken by another shall show from her stern to such last-mentioned ship a white light or a flare-up light.

#### *Sound Signals for Fog, &c.*

Art. 12. A steam-ship shall be provided with a steam whistle or other efficient steam sound signal, so placed that the sound may not be intercepted by any obstructions, and with an efficient fog horn to be sounded by a bellows or other mechanical means, and also with an efficient bell.\* A sailing ship shall be provided with a similar fog-horn and bell.

In fog, mist, or falling snow, whether by day or night, the signals described in this Article shall be used as follows; that is to say—

- (a) A steam-ship under way shall make with her steam whistle, or other steam sound signal, at intervals of not more than two minutes, a prolonged blast.
- (b) A sailing ship under way shall make with her fog-horn, at intervals of not more than two minutes, when on the

\* In all cases where the regulations require a bell to be used, a drum will be substituted on board Turkish vessels.

starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.

- (c) A steam-ship and a sailing ship, when not under way shall, at intervals of not more than two minutes, ring the bell.

*Speed of Ships to be moderate in Fog, &c.*

Art. 18. Every ship, whether a sailing ship or steam-ship, shall in a fog, mist, or falling snow, go at a moderate speed.

*Steering and Sailing Rules.*

Art. 14. When two sailing ships are approaching one another so as to involve risk of collision, one of them shall keep out of the way of the other, as follows, viz.—

- (a) A ship which is running free shall keep out of the way of a ship which is close-hauled.
- (b) A ship which is close-hauled on the port tack shall keep out of the way of a ship which is close-hauled on the starboard tack.
- (c) When both are running free with the wind on different sides, the ship which has the wind on the port side shall keep out of the way of the other.
- (d) When both are running free with the wind on the same side, the ship which is to windward shall keep out of the way of the ship which is to leeward.
- (e) A ship which has the wind aft shall keep out of the way of the other ship.

Art. 15. If two ships under steam are meeting end on, or nearly end on, so as to involve risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other.

This Article only applies to cases where ships are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two ships which must, if both keep on their respective courses, pass clear of each other.

The only cases to which it does apply are, when each of the two ships is end on, or nearly end on, to the other; in other words, in cases in which, by day, each ship sees the masts of the other in a line, or nearly in a line, with her own; and by night, to cases in which each ship is in such a position as to see both the side-lights of the other.

It does not apply, by day, to cases in which a ship sees another ahead crossing her own course; or by night, to cases where the red light of one ship is opposed to the red light of the other, or where the green light of one ship is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

Art. 16. If two ships under steam are crossing, so as to involve risk of collision, the ship which has the other on her own starboard side shall keep out of the way of the other.

Art. 17. If two ships, one of which is a sailing ship, and the other a steam-ship, are proceeding in such directions as to involve risk of collision, the steam-ship shall keep out of the way of the sailing ship.

Art. 18. Every steam-ship, when approaching another ship, so as to involve risk of collision, shall slacken her speed or stop and reverse, if necessary.

Art. 19. In taking any course authorised or required by these Regulations, a steam-ship under way may indicate that course to any other ship which she has in sight by the following signals on her steam whistle, viz.—

One short blast to mean "I am directing my course to starboard."

Two short blasts to mean "I am directing my course to port."

Three short blasts to mean "I am going full speed astern."

The use of these signals is optional; but if they are used, the course of the ship must be in accordance with the signal made.

Art. 20. Notwithstanding anything contained in any preceding Article, every ship, whether a sailing ship or a steam-ship, overtaking any other shall keep out of the way of the overtaken ship.

Art. 21. In narrow channels every steam-ship shall, when it is safe and practicable, keep to that side of the fairway or mid-channel which lies on the starboard side of such ship.

Art. 22. Where by the above rules one of two ships is to keep out of the way, the other shall keep her course.

Art. 23. In obeying and construing these rules due regard shall be had to all dangers of navigation; and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

*No Ship, under any circumstances, to neglect proper Precautions.*

**Art. 24.** Nothing in these rules shall exonerate any ship, or the owner, or master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look-out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

*Reservation of Rules for Harbours and Inland Navigation.*

**Art. 25.** Nothing in these rules shall interfere with the operation of a special rule, duly made by local authority, relative to the navigation of any harbour, river, or inland navigation.

*Special Lights for Squadrons and Convoys.*

**Art. 26.** Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war or for ships sailing under convoy.

**Art. 27.** When a ship is in distress, and requires assistance from other ships or from the shore, the following shall be the signals to be used or displayed by her, either together or separately, that is to say—

In the day-time—

1. A gun fired at intervals of about a minute.
2. The International Code signal of distress indicated by N.C.
3. The distant signal, consisting of a square flag, having either above or below it a ball or anything resembling a ball.

At night—

1. A gun fired at intervals of about a minute.
2. Flames on the ship (as from a burning tar barrel, oil barrel, &c.).
3. Rockets or shells, throwing stars of any colour or description; fired one at a time, at short intervals.

**ORDERS IN COUNCIL OF 30TH DECEMBER 1884  
AND 24TH JUNE 1885.**

**ALTERNATIVE LIGHTS FOR TRAWLERS WHEN ENGAGED IN  
TRAWLING, HAVING THEIR TRAWLS IN THE WATER AND  
NOT BEING STATIONARY.**

**1884.—PART I.—STEAM VESSELS OF 20 TONS GROSS REGISTER  
TONNAGE OR UPWARDS.**

(1.) On or in front of the foremast head and in the same position as the white light which other steam-ships are required to carry, a lanthorn showing a white light ahead, a green light on the starboard side, and a red light on the port side, such lanthorn shall be so constructed, fitted, and arranged as to show an uniform and unbroken white light over an arc of the horizon of four points of the compass, an uniform and unbroken green light over an arc of the horizon of 10 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 10 points of the compass, and it shall be so fixed as to show the white light from right ahead to two points on the bow on each side of the ship, the green light from two points on the starboard bow to four points abaft the beam on the starboard side, and the red light from two points on the port bow to four points abaft the beam on the port side: (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, the lanthorn containing such white light shall be carried lower than the lanthorn showing the green, white, and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet nor more than 12 feet.

**1884.—PART II.—SAILING VESSELS OF 20 TONS NET REGISTER  
TONNAGE OR UPWARDS.**

(1.) On or in front of the foremast head a lanthorn having a green glass on the starboard side and a red glass on the port side, so constructed, fitted, and arranged that the red and green do not converge, and so as to show an uniform and unbroken green light over an arc of the horizon of 12 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 12 points of the compass, and it shall be so fixed as to show the green light from right ahead to four points abaft the beam on the starboard side, and the red light from right ahead to four points abaft

the beam on the port side : and (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, the lanthorn containing such white light shall be carried lower than the lanthorn showing the green and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet and not more than 12 feet.

1885.—SAILING TRAWLERS OF ANY TONNAGE.

As regards sailing vessels engaged in trawling, such vessels having their trawls in the water and not being stationary in consequence of their gear getting fast to a rock or other obstruction, if they do not carry and show the lights required by Article 6 of the Regulations aforesaid, or the other lights of the description set forth in Part 2 of the Schedule to the said recited Order in Council of the 30th of December, 1884, shall carry and show in lieu of the lights required by Article 6 of the Regulations aforesaid, or the other lights of the description set forth in paragraph 2 of the Schedule to the said recited Order, other lights as follows, that is to say :

A white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, and visible on a dark night with a clear atmosphere for a distance of at least 2 miles ; and also a sufficient supply of red pyrotechnic lights which shall each burn for at least 30 seconds, and shall, when so burning, be visible for the same distance under the same conditions as the white light. The white light shall be shown from sunset to sunrise, and one of the red pyrotechnic lights shall be shown on approaching, or on being approached by another ship or vessel in sufficient time to prevent collision.

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AIDS TO MEMORY in four verses, by THOMAS GRAY.

1. *Two Steam-ships meeting.*

When both side-lights you see ahead—  
Port your helm and show your RED.

2. *Two Steam-ships passing.*

GREEN TO GREEN—or, RED TO RED—  
Perfect safety—Go ahead !

3. *Two Steam-ships crossing.*

*Note.*—This is the position of greatest danger : there is nothing for it but good look-out, caution, and judgment.

If to your starboard RED appear,  
It is your duty to keep clear;  
To act as judgment says is proper.—  
To port—or Starboard—Back,—or Stop her!  
But when upon your Port is seen  
A Steamer's Starboard Light of GREEN,  
There's not so much for you to do.  
For GREEN to Port keeps clear of you.

4. *All Ships must keep a good look-out, and Steam-ships must stop and go astern, if necessary.*

Both in safety and in doubt  
Always keep a good look-out;  
In danger, with no room to turn,  
Ease her, stop her, go astern.

14th October 1867.

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APPENDIX E.

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DISTRESS AND PILOT SIGNALS.

The following sections, together with the schedules referred to M. S. Act, therein, of the "Merchant Shipping Acts Amendment Act, 1873," relate to Signals of Distress and signals for Pilots. (See also "Regulations for preventing Collisions at sea." Article 27.)

18. The signals specified in the first schedule to this Act shall be deemed to be signals of distress.

Any master of a vessel who uses or displays, or causes or permits any person under his authority to use or display, any of the said signals, except in the case of a vessel being in distress, shall be liable to pay compensation for any labour undertaken, risk incurred, or loss sustained in consequence of such signal having been supposed to be a signal of distress, and such compensation may, without prejudice to any other remedy, be recovered in the same manner in which salvage is recoverable.

Signals for  
pilots.

19. If a vessel requires the services of a pilot, the signals to be used and displayed shall be those specified in the second schedule to this Act.

Any master of a vessel who uses or displays, or causes or permits any person under his authority to use or display, any of the said signals for any other purpose than that of summoning a pilot, or uses or causes or permits any person under his authority to use any other signal for a pilot, shall incur a penalty not exceeding twenty pounds.

Power to alter  
rules as to  
signals.

20. Her Majesty may from time to time by Order in Council repeal or alter the rules as to signals contained in the schedules to this Act, or make new rules in addition thereto, or in substitution therefor, and any alterations in or additions to such rules made in manner aforesaid shall be of the same force as the rules in the said schedules.

## SCHEDULES.

## SCHEDULE I.

## SIGNALS OF DISTRESS.

*In the day-time.*—The following signals, numbered 1, 2 and 3, when used or displayed together or separately, shall be deemed to be signals of distress in the day-time:—

1. A gun fired at intervals of about a minute;
2. The International Code signal of distress indicated by N C;
3. The distant signal, consisting of a square flag having either above or below it a ball, or anything resembling a ball.

*At night.*—The following signals, numbered 1, 2 and 3, when used or displayed together or separately, shall be deemed to be signals of distress at night:

1. A gun fired at intervals of about a minute;
2. Flames on the ship (as from a burning tar barrel, oil barrel, &c.);
3. Rockets or shells, of any colour or description, fired one at a time, at short intervals.

## SCHEDULE II.

## SIGNALS TO BE MADE BY SHIPS WANTING A PILOT.

*In the day-time.*—The following signals, numbered 1 and 2, when used or displayed together or separately, shall be deemed to be signals for a pilot in the day-time, viz.—

1. To be hoisted at the fore, the Jack or other national colour usually worn by merchant ships, having round it a white border, one-fifth of the breadth of the flag; or
2. The International Code pilotage signal indicated by P T.

*At night.*—The following signals, numbered 1 and 2, when used or displayed together or separately, shall be deemed to be signals for a pilot at night, viz.—

1. The pyrotechnic light, commonly known as a blue light, every fifteen minutes; or
2. A bright white light, flashed or shown at short or frequent intervals, just above the bulwarks, for about a minute at a time.

## APPENDIX F.

## EXAMINATION IN CHART.

*For all Grades where the Chart is used.*

[The candidate will be required to work out the following questions on either a "true" or "magnetic" chart\* whichever may be handed to him by the Examiner; and also determine whether the chart is a "true" or "magnetic" one, and whether it is for the northern or southern, and eastern or western hemisphere.]

\* The terms "true" and "magnetic" are used for the sake of brevity and convenience, for indicating charts that have compasses delineated upon them showing the "true" or "magnetic" point of the compass respectively.

1. Using deviation [card] [curve\*] No. , find the course to steer by compass from to ; also the distance.

Answer.—Compass course

Distance

Variation

Deviation

2. With the ship's head on the above-named compass course a [point] [light-house] bore by compass and bore by the same compass, find the ship's position.

Answer.—Latitude

Longitude

3. With the ship's head as above, a [point] [light-house] bore by compass , and after continuing on the same course miles it bore , find the position of ship and her distance from at the time of taking the second bearing.

Answer.—Latitude

Longitude

Distance

All the foregoing questions must be answered, but this does not preclude the Examiner from putting any other questions of a practical character or which the local circumstances of the port may require.

Signature

Date

Chart used

*Additional for Masters.*

4. Find the course to steer by compass from to (see Question 1) to counteract the effect of a current which set at the rate of miles per hour, the ship making by log miles per hour; also the distance the ship would then make good in hours towards

Answer.—Compass course

Distance

5. On being off took a cast of the lead; required the correction to be applied to the depth obtained by the lead line before comparing it with the depth marked on the chart.

6. What do you understand the small numbers to indicate that you see placed about the chart, and at what time of tide?

7. What do the Roman numerals indicate that are occasionally seen near the coasts and in harbours?

8. How would you find, approximately, the time of high water at any place, the Admiralty tables not being at hand, nor any other special tables available?

All the foregoing questions, and those on Form Exn. 9C., must be answered, but this does not preclude the Examiner from putting any other questions of a practical character or which the local circumstances of the port may require.

Signature

Date

\* A Candidate for a Master's Certificate is expected to use either a card of deviations or a curve of deviations on a Napier's diagram, whichever the Examiner may think proper to put before him.

## APPENDIX G.

## DEVIATION OF THE COMPASS.

N. B.—The Examiner will not mark less than 12 of the following questions, which must be correctly answered by the candidate, and the Examiner's attention is specially called to the importance of Questions 7, 8, 9, 10, and 19, which should be marked in all cases.

1. What do you mean by Deviation of the Compass?
2. How do you determine the deviation (a) when in port, and (b) when at sea?
3. Having determined the deviation with the ship's head on the various points of the Compass, how do you know when it is easterly and when westerly?
4. Why is it necessary, in order to ascertain the deviations, to bring the ship's head in more than one direction?
5. For accuracy, what is the least number of points to which the ship's head should be brought?
6. How would you find the deviation when sailing along a well-known coast?
7. In the following table give the correct magnetic bearing of the distant object, and thence the deviation:—

Ship's head by Standard Compass.	Bearing of distant object by Standard Compass.	Deviation required.	Ship's head by Standard Compass.	Bearing of distant object by Standard Compass.	Deviation required.
North N.-E. East S.-E.			South S.-W. West N.-W.		

8. With the deviation as above, give the courses you would steer by the Standard Compass to make the following courses, correct magnetic [ ].
9. Supposing you have steered the following courses by the Standard Compass, find the correct magnetic courses made from the above deviation table [ ].
10. You have taken the following bearings of two distant objects by your Standard Compass as above; with the ship's head at [ ], find the bearings, correct magnetic [ ].
11. Name some suitable objects by which you could readily obtain the deviation of the Compass when sailing along the coasts of the English Channel.
12. Do you expect the deviation to change; if so, state under what circumstances?
13. How often is it advisable to test the accuracy of your table of deviations?
14. State briefly what you have chiefly to guard against in selecting a position for the Compass.
15. The Compasses of iron ships are more or less affected by what is termed the heeling error; on what courses does this error vanish, and on what courses is it the greatest?
16. State to which side of the ship, in the majority of cases, is the North point of the Compass drawn in the Northern Hemisphere; and what effect has it on the assumed position of the ship when she is steering on Northerly, and also on Southerly courses?
17. The effect being as you state, on what courses would you keep away, and on what courses would you keep closer to the wind, in order to make good a given Compass course?
18. Does the same rule hold good in both hemispheres with regard to the heeling error?
19. Your Steering Compass having a large error, how would you proceed to correct that Compass by compensating magnets and soft iron, in order to reduce the error within manageable limits?

## APPENDIX H.

## SYLLABUS OF EXAMINATION in the LAWS of the DEVIATION of the COMPASSES of an IRON SHIP, and in the Means of compensating or correcting it.

Candidates for the voluntary examination in Compass Deviation, and also for Extra Masters' Certificates, will be examined in the whole of this syllabus, and will be required to answer all

the questions correctly, and to the entire satisfaction of the Examiner.

1. Describe an artificial magnet, and how a steel bar or needle is usually magnetized.

2. [For the sake of simplicity it is desirable to adopt the nomenclature of the Astronomer Royal, and call that pole of the compass needle that points to the magnetic north the red, and the other the blue pole.] What effect has the pole of one magnet of either name on the pole of the same name of another magnet, and what would be the consequence of the pole of one magnet of either name being brought near enough to affect the pole of contrary name, if in these cases both magnets were freely suspended ?

3. By applying this law to all magnets, natural as well as artificial, show what would be the result on a magnetic bar or needle, freely suspended, but by weight or by the nature of its mounting constrained to preserve a horizontal position ; and what result, if so mounted, but free to move in every direction, the earth being regarded as a natural magnet ?

4. Which is the red magnetic pole of the earth, and which the blue ?

5. What is the cause of the variation of the compass ?

6. What is meant by the deviation of the compass ?

7. Describe the sub-permanent magnetism of an iron ship, and state when and how it is acquired, and which is the sub-permanent red, and which is the blue pole, and why it is called sub-permanent magnetism.

8. What is meant by "the composition of forces" and "the parallelogram of forces," and show how the knowledge of these is valuable in ascertaining and compensating the sub-permanent magnetism of an iron ship ?

9. Describe the co-efficients B and C, plus (+), and minus (-), and why they are said to produce semi-circular deviations.

10. On what points by compass bearing of the ship's head does + B give westerly deviation, and on what does it give easterly ; and also on what point does — B give westerly, and on what points easterly ?

11. On what points does + C give westerly, and on what points easterly ; also on what points does — C give westerly, and on what points easterly deviation ?

12. How would you compensate the co-efficient C ?

13. How would you compensate the co-efficient B ?

14. If the value either of co-efficient B or C be given, also the magnetic direction of the ship's head while she was being built, how by the traverse tables would you determine the approximate value of the other co-efficient C or B ; and if the value of both these co-efficients be given, how would you determine approximately the direction, by compass, of the ship's head whilst being built ?

15. What is meant by transient induced magnetism ?

16. Under what circumstances does induced magnetism give semi-circular deviation ?

17. How would you compensate — B resulting from induced magnetism, and why for this purpose would you adopt a different mode of compensation to that employed in correcting — B produced by sub-permanent magnetism ?

18. Describe quadrantal deviation, and state what co-efficients represent it ; also on what points of the ship's head, by compass, each of these co-efficients gives the greatest amount of deviation.

19. On what points of the compass will each of these co-efficients, D and E + and —, give easterly, and on what points westerly deviation ?

20. Generally + D gives the greatest amount of quadrantal deviation : how should it be compensated ?

21. If D be compensated in the manner you have described, will it remain so in every latitude ? If so, state the reason why.

22. What conditions of the iron of a ship will produce + D and what — D ?

23. Describe the nature of the deviation resulting from + A and — A, and describe the error in the construction of the compass that frequently produces them.

24. Under what circumstances does the character of A and E so change as to render it desirable that these co-efficients should be disregarded or modified ?

25. The value of A, B, C, D, and E being given, or B, C, and D only, find the deviation on any required point of the compass, or construct a table of deviation, if required.

26. Describe how you would determine the deviation by means of a distant object, by reciprocal bearings, or by the figures on the deck walls.

27. If it be required to determine the deviation of two or more compasses, it is most convenient to bring the ship's head, *correct* magnetic, on as many points as may be necessary. To determine the co-efficients B, C, and D, the bearing of the ship's head by each compass is required. How would you for this purpose employ a Graphic Method?

28. State your rule for determining whether deviation is easterly or westerly.

29. Describe the use of the "dumb card," or an azimuth card without a needle, in compensating a compass.

30. If you determine the deviation by an azimuth or an amplitude of a heavenly body, it is then combined with variation,\* which together is sometimes called the *correction* for the compass. State when the deviation is the difference between the variation and the *correction*, and when the sum; and when it is of the same name as that of the *correction*, and when of the contrary name.

31. In observing azimuths of heavenly bodies, the best method is by "time azimuths," since these can be observed without an altitude when the ship is in port, or the horizon cannot be defined from any cause. Given the sun's declination, the hour of the day, and the latitude to find the true bearing of the sun.<sup>†</sup>

32. By night, if it be desirable to observe the *correction* of the compass. Given the day of the year, and time at ship, also the latitude of the place to determine what<sup>‡</sup> star will be in good position for this purpose.

33. If your correcting magnets are so mounted that their positions can be altered, describe the process by which, on open sea, you can place the ship's head correct magnetic N. (or S.), and correct magnetic E. (or W.), and can make the correction perfect.

34. Given the name of a star, the time, the place of ship, the variation of the compass, and the bearing of the star by compass.

Determine the deviation, and name it east or west.

35. If an ordinary standard compass placed higher than the iron top sides be compensated whilst the ship is upright, what coefficient will be effected by heeling?

36. When generally will this co-efficient be plus, and when minus?

37. State the exceptions to this general rule.

38. Does the heeling error arise from the altered position of the sub-permanent poles of the ship, or from a change in the induced magnetism?

39. To what extent is the heeling error altered by a change in the magnetic latitude of the ship?

40. If a ship is beating to windward; when she tacks, under what circumstances will the heeling error retain the same name, and under what circumstances will it take the contrary name?

41. If a ship is placed on the opposite tack by the change of wind, the ship's course being the same by compass, will the heeling error change its name?

42. Under what circumstances will the heeling error, if disregarded, take the ship to windward, or when to leeward?

43. Can the heeling error be compensated? If so, state the means to be employed.

44. Can the compensation of the heeling error be depended on in every latitude? If not, state the reason.

45. Given the heel, the direction of the ship's head by compass, and the heeling error observed, to find the approximate heeling error, with a greater or less given heel, and with the ship's head on some other named point of the compass, the ship's magnetic latitude being in both cases the same.

46. Describe any instrument to show the ship's heel (generally called a clinometer), and state how and where it should be fixed.

47. Should the clinometer be observed when the ship is swung to determine the deviation when the ship is upright? If so, state the reason why.

#### APPENDIX I.

##### PARTICULARS OF EXAMINATION IN SUMNER'S METHOD BY PROJECTION.

Candidates are required to compute their longitude by chronometer worked with two assumed latitudes.

\* The magnetic variation is best determined by a chart of the curves of equal magnetic variation.

<sup>†</sup> The process of finding time azimuths by the ordinary formulae of spherical trigonometry is tedious, and since on board an iron ship these observations should be often repeated, the candidate will be allowed to use any table or graphic or linear method that will solve the problem within a half of a degree, the altitude of the heavenly body not being given.

They are to mark off on the chart the two positions ascertained by the first altitude, and are then to connect them with a straight line, termed the *line of position*, or the line of equal altitude, which will show the bearing of any land it may intersect.

They will then be required to correct the first *line of position* for the ship's change of station, in the interval between the two observations, to project the *line of position* corresponding to the second observation on the chart, showing by its intersection with the first *line of position*, as corrected for change of station, the position of the ship at the time of the second observation.

The longitudes corresponding to the two latitudes by the second observation are no longer furnished by the Examiners. The candidates are consequently required to work out the whole of the problem for themselves (in place of the explanation recently required), and must be prepared to find the sun's true bearing by projection at the time of taking either the first or second observation; and when necessary to produce the *lines of positions* on the chart in order to make them cut one another should the position of the ship happen to be outside the parallels of the two assumed latitudes given in the question. Outline charts, extending from  $46^{\circ}$  to  $49^{\circ}$  and from  $49^{\circ}$  to  $52^{\circ}$  of latitude, respectively, are furnished by the Board of Trade to the different examiners for this purpose.

#### APPENDIX K.

The Candidate must answer in writing, on paper supplied to him by the Examiner, the following questions, numbering the answer to correspond with the questions.

Question—

1. The direction of the wind in a cyclone being\* \_\_\_\_\_ state the probable bearing of its centre from the ship in the\* \_\_\_\_\_ Hemisphere. Questions relating to cyclones or revolving storms common in tropical seas.
2. And suppose that the wind during the passage of the same cyclone were found to change towards the\* \_\_\_\_\_, what would be the ship's position with reference to the line of progression of the centre of the cyclone, and what action would you take ?
3. Under what conditions would the change in the direction of the wind in the cyclone be the reverse of the above ?
4. What are the usual indications of a ship being on the line of progression of the centre of a cyclone ?
5. What are the usual indications that a ship is (a) approaching the centre of a cyclone ; (b) receding from it ?
6. Describe the track usually taken by cyclones in the † \_\_\_\_\_, and state the seasons of the year in which they most frequently occur in that region.

#### APPENDIX L.

##### INSTRUCTIONS TO EXAMINERS.

###### *Examination in Colours.*

Herewith are—

- (a) A lanthorn having in it a lamp in which kerosine is to be burnt.
- (b) A slide having ground glass in it.
- (c) Nine slides, each having a coloured glass in it. The colours are as follows :—
  1. Red (Standard).
  2. Pink or salmon.
  3. Green (Standard or No. 1).
  4. Green (Bottle or No. 2).
  5. Green\* (Pale or No. 3).
  6. Yellow.
  7. Neutral.\*
  8. Blue (Standard).
  9. Blue\* (Pale).

\* These spaces to be filled in by the Examiners, and frequently varied.

† The Examiners to fill in whether North Atlantic, Bay of Bengal, China Seas, Indian Ocean, &c., &c.

## (d) Cards, five of each as follow :—

1. White.
2. Black.
3. Red.
4. Pink.\*
5. Green.
6. Drab.\*
7. Blue.
8. Yellow.

*Examination by Daylight. (Cards.)*

In conducting the examination by daylight, the examiner should do it in three ways—

1. The cards should be mixed up. The examiner should then hold up each card separately, and ask the candidate to name the colour, and if the candidate does so without hesitation, he is to be regarded as having passed the daylight test.
2. If the candidate hesitates in any of his answers, so as to raise a doubt in the mind of the examiner as to his ability to readily distinguish colours, the examiner should put all the cards on the table and require the candidate to select all cards of a colour or colours named by the examiner.
3. Having done that, they should all be mixed up again and the candidate should be required to sort the cards into eight heaps, putting all of one colour into each heap.
4. The result of the examination should be noted and recorded in each case.

*Examination by artificial Light.*

The room should be dark.

The lamp lighted and placed in the lanthorn.

The applicant should be seated or should stand so as to be opposite to the opening of the lanthorn, and at least 15 feet from the front of the lanthorn.

He should first of all see the light in the lanthorn without the interposition of any glass and be asked if it appears to him to have any colour; and if so, what colour?

The slide with the ground glass should then be put into the opening at the front of the lanthorn which is nearest to the light, and the applicant asked the same question.

The slide with the ground glass is to be left in, and the slides with the coloured glasses placed one by one and separately in front of it, and the candidate asked in each case to name the colour or tint.

The result of the examination should of course be noted and recorded in each case.

*General.*

The cards and glasses against which a star \* is placed in the list are what may be called confusion tints. The candidate is not to be regarded as having "failed" if he miscalls these tints, provided that he names all the others correctly. But if having named all the others correctly he miscalls these so far as to name the drab card No. 6 as red, pink, salmon, &c.; or to name card No. 7 as red, green, or yellow; or glass No. 2 as green, blue, or yellow; or glass No. 5 as red, pink, salmon, &c.; or glass No. 7 as bright red or bright green; or the plain ground glass any colour, the case should be reported for record. In short, if the candidate's perception or impression of these tints does not agree with the perception of the examiner, the case should be reported on the Form Exa. 17B.

The only reasons for which a candidate is to be reported as having failed are inability to distinguish red from green, or either from black, by daylight; and red from green, or either from the ground glass, by artificial light.

If a candidate fails in the colour test when the ground glass is in the lanthorn (as it is always to be when the coloured glasses are shown), he may also be tried over again with the coloured glasses without the intervention of the ground glass, and the result noted and recorded.

## APPENDIX M.

## INSTRUCTIONS TO EXAMINERS.

*Compass Adjustment.*

It is of the utmost importance that masters of ships should thoroughly understand the tentative method of Compass Adjust-

ment as generally practised in merchant ships, and Examiners are therefore directed to fully satisfy themselves that all Candidates for Masters' Certificates have this particular knowledge. It should be tested in connexion with the Form of Examination, "Exn. 7," or it may be tested by Captain Beall's "Deviascope" at those ports which have been supplied with this instrument. Where the "Deviascope" is used it will not be necessary for the Candidates to give the written answers and sketches illustrative of the Question 19 of Form Examination 7.

A concise statement of the present method of tentative Compass Adjustment is forwarded for the use of Examiners. The Government wish them, however, distinctly to understand that the Government are not in any way advocating the correction of that part of co-efficient B which arises from vertical induction in soft iron by a permanent magnet instead of by a soft iron bar. The Government have no authority to interfere with the methods in use amongst Compass adjusters for the adjustment of Compasses in iron ships, but instruct the Examiners to satisfy themselves that masters are acquainted with the ordinary method as at present practised.

The examination by the "Deviascope" is at present only experimental, and no Candidate should be reported as having "failed" who does not pass the examination in it, provided he has answered satisfactorily the Question 19, "Exn. 7."

The "Deviascope" is sent only to three ports at present, and its extended use will depend upon experience at those ports.

**The TENTATIVE METHOD of COMPASS ADJUSTMENT as generally practised by COMPASS ADJUSTERS in SHIPS of the MERCANTILE MARINE.**

Before describing the practice it will be as well to briefly state the co-efficients used to express the different magnetic forces:—

Co-efficient A represents a constant quantity.

"	B	" semi-circular deviation due to fore and aft magnetic forces.
"	C	" semi-circular deviation due to transverse magnetic forces.
"	D	" quadrantal deviation due to horizontal induction in soft iron.
"	E	" quadrantal deviation due to horizontal induction in soft iron unsymmetrically distributed.

**SIGNS and EFFECTS of CO-EFFICIENTS A, B, C, D, and E.**

Co-efficient A represents a constant deviation of the same nature and amount, on all points of the compass; + A signifying easterly, and — A, westerly deviation.

Co-efficient + B represents an attraction towards the ship's head, and causes easterly deviations with ship's head in the eastern semi-circle of the Compass, and westerly deviations in the western semi-circle, attaining a maximum value on the east and west points, decreasing to zero on north and south points, by Compass.

Co-efficient — B represents an attraction towards the ship's stern, and causes easterly deviations with ship's head in the western semi-circle, and westerly deviations with the ship's head in the eastern semi-circle, with a maximum value on the east and west points, decreasing to zero on the north and south points, by Compass.

Co-efficient + C represents an attraction towards the starboard side of the ship, and causes easterly deviations with ship's head in the northern semi-circle, and westerly deviations in the southern semi-circle, attaining a maximum value on the north and south points, decreasing to zero on the east and west points, by Compass.

Co-efficient — C represents an attraction towards the port side of the ship, and causes westerly deviations with ship's head in the northern semi-circle, and easterly in the southern semi-circle, attaining a maximum value on the north and south points, decreasing to zero on the east and west points, by Compass.

Co-efficient + D gives easterly deviations with ship's head between N. and E. and S. and W., and westerly deviations between S. and E. and N. and W.

Co-efficient — D gives results exactly the reverse to + D.

*Note.—* Both + D and — D have a maximum value on the four quadrantal points, and become zero on the cardinal points by Compass.

Co-efficient + E gives easterly deviations with ship's head between N.E. and N.W. and S.E. and S. W. and westerly deviations between N.E. and S.E. and N.W. and S.W.

Co-efficient -- E gives results exactly the reverse to + E.

*Note.*—Both + E and -- E have a maximum value on the cardinal points, and become zero on the four quadrantal points, but are usually very small in amount in Compasses placed in the middle line of the ship.

*Heeling Error.*—The heeling error arises partly from vertical induction in transverse iron, and iron vertical to the ship's deck, and partly from the vertical component of the sub-permanent magnetism of the ship. In the Northern Hemisphere in the majority of cases the N. point of the Compass needle is drawn to windward or the high side of the ship, with, as a rule, a maximum heeling error on N. and S. points, and zero on E. and W. points by Compass. If the Compass is not properly placed in the ship, there may be a sensible heeling deviation on E. and W. courses.

#### TENTATIVE CORRECTIONS.

*To correct co-efficient C.*—With ship's head north or south, magnetic, place a bar magnet (or more than one if necessary) horizontally and exactly athwart ship, either on the deck or on any convenient platform, with its centre on the fore and aft line passing through the centre of the Compass card, placing its red or marked end to starboard if the N. point of the needle deviates to the starboard side, or to port if it deviates to the port side of the ship, moving the magnet to or from the Compass until it points correctly.

*Note.*—The deviation represented by co-efficient C varies inversely as the earth's horizontal force, providing the iron is symmetrically arranged on each side of the Compass.

*To correct co-efficient B.*—With ship's head east or west, magnetic, place a bar magnet (or more than one if necessary) horizontally and exactly parallel to the fore and aft midship line of the ship, either on the deck or on any convenient platform, with its centre on the athwart ship line passing through the centre of the Compass, the red or marked end of the magnet being directed aft if the end point of the Compass needle deviates towards the stern, or forward if it deviates towards the bow, moving the magnet to or from the Compass until it points correctly.

*Note.*—The co-efficient B consists of two parts: one is due to the permanent magnetism of the ship, which varies inversely as the earth's horizontal force; the other to vertical induction in soft iron, which varies as the tangent of the dip. As ships in the merchant service are rarely built with a view of providing a satisfactory position for the standard Compasses, it is very difficult in many ships to find a position for it where it will not be affected by vertical iron. It follows, therefore, that if this deviation be compensated, as is customary, by a fore and aft permanent magnet instead of by a vertical soft iron bar, the poles of the magnet may in some cases require to be reversed in high southern latitudes.

*To correct co-efficient + D.*—With ship's head on one of the quadrantal points, magnetic, the + D is generally corrected by boxes of small chain, cylinders of soft iron, or soft iron globes placed athwart ship on the same level, and at equal distances, on the port and starboard sides of the Compass, with the centre of their mass on a level with the Compass needle, move them to or from the Compass till the needle points correctly.

*To correct co-efficient -D.*—Co-efficient -D, which is of very rare occurrence, is corrected by placing the above correctors on the fore and aft sides of the compass.

*Note.*—When once the co-efficient D is properly corrected by soft iron it is correct for all magnetic latitudes, provided the distribution of the iron in the ship is not materially changed, and provided the magnetism of the soft iron has not been affected by the Compass needles. With short needles having small magnetic power, such for instance as Sir Wm. Thomson's, there will probably be no change; but when the needles are long and powerful, one-half the original D may be expected to return when approaching the magnetic equator. See Admiralty Manual, 1882, page 96, as follows:—"When a compass with long and powerful needles is employed, soft iron correctors placed very near it become magnetized by induction according to the power of the

" needles, and the resulting correction will not remain  
" strictly perfect in all latitudes."

*To correct Heeling Error.*—The heeling error is corrected for any given magnetic latitude by placing a vertical magnet exactly under the centre of the Compass card, with its N. or red pole uppermost if the heeling error is to windward or to the high side of ship, or its S. or blue end uppermost if to leeward or to the low side of ship, moving the magnet to or from the Compass until the heeling error is corrected.

*Note.*—The heeling error, due to the permanent part of the magnetism, varies inversely as the earth's horizontal force, and consequently is greatest in high latitudes, diminishes as the ship approaches the magnetic equator, and increases again, still retaining the same name, as the ship recedes from the magnetic equator in the Southern Hemisphere. The heeling error, due to transverse and vertical soft iron, decreases as the ship approaches the magnetic equator, where it is zero, and is of a contrary name in the Southern Hemisphere. It is probable that the poles of the vertical magnet may require to be reversed in high southern latitudes.

A divided scale should be marked or fitted outside the tube or some other convenient place, so as to show the proper position for the correcting magnet as found in any given magnetic latitude, and the same recorded as a guide for approximately placing the magnet in position on any subsequent voyage in the same locality, and especially on the return of the ship to the United Kingdom.

Candidates should understand that the object of tentative adjustment is to bring the deviations within manageable limits, and also to equalise the directive force of the needle so far as is practicable on all courses; but no system of adjustment whatever is sufficiently reliable in character to absolve the navigator from the necessity of using every precaution, and especially of ascertaining the deviation on every available opportunity by observations of the sun by day and the other heavenly bodies by night.

#### APPENDIX N.

(From Memorandum on Examination of Engineers.)

#### EXAMINATION OF A MASTER OR MATE IN STEAM

The regulations under which these examinations are conducted are printed at pages 41 to 43 of the regulations for examinations of masters and mates. (Exn. 1.)

A candidate for this examination is required to have a thorough grasp of the construction of the steam engine and boiler, to enable him, in the first place, to understand the nature and importance of any defect which may be reported to him by the engineer, and so that he may work in harmony with the engineer in affording time and facilities for disconnexions, inspections, adjustments, and repairs.

To have a looking-on knowledge of what the principal repairs are about engines and boilers and pipes, and how these repairs are accomplished.

To be able to form an independent opinion as to a breakdown and the consequent propriety or impropriety of proceeding under steam with temporarily repaired or defective machinery.

To understand how to estimate approximately the reduction of fuel required for reduced speed, and consequently to sanction such reduction of speed as may seem to him to be warranted by the report of the engineer, and to satisfy himself before leaving port that there is sufficient coal for the voyage.

To have an intelligent grasp of the general run of pipes and connexions in the engine room, the marking of cocks, the opening and closing of cocks and valves, how mistakes of importance may be made in the confusion of an accident, and how best to guard against such mistakes.

To be capable of being left in charge of the feeding of a set of boilers, to understand the working of the water-gauge, and to be able to guard against being misled by false indications of the gauge glass.

To understand about blowing down and surfacing, the reasons for doing so, and the danger which may result from the neglect of these under certain circumstances. A master or mate presenting himself for examination in steam must be understood to have made up for his want of practical experience by reading up

about the steam engine. He ought, therefore, to show that he has given his mind to intelligently understanding the *rationale* of the action of the steam engine. Under this head, he should, therefore, be able to state approximately the quantity of heat required in the formation of steam, the remarkable relation of "latent" heat to "sensible" heat, using these popular names, how much steam can be raised by the combustion of one pound of coal, what horse-power measure is, what indicated horse-power is, the action of the slide-valve, the course of the steam through the engine, the advantage of working expansively, and how the expansive action is shown by the indicator diagram.

The candidate has to answer in writing 16 out of 20 questions selected from the book of Elementary Questinos.\* Selections for this examination are given on the alphabetic sheet for "Steam." Generally, these answers are given by candidates as learned by rote from a book; the candidate should therefore be asked such *vivæ voce* questions as will necessitate his giving his answers in different words, so as to discover whether he has the root of the matter in him.

The principal part of the *vivæ voce* is the examination on board a steamer, preferably one with which he is unacquainted. He is told to look about and try to find out the run of the machinery without the assistance of any one; the Examiner to be in the engine-room to see that this independent examination is properly carried out. When the candidate reports that he thinks he knows the whole arrangement of the machinery, the Examiner will then question him on the uses of the parts, get him to point out the different cylinders, pumps, valves, condenser, &c. He must show that he understands the run of the pipes in the bilges, not necessarily that he has gone over every one of them, but he ought to be directed to trace, at least, one important range of pipes, and to thoroughly satisfy the Examiner that he could be safely trusted to manipulate the valves or cocks in connexion therewith. It will not often be practicable for the candidate to be asked to actually work engines under steam, but he must satisfy the Examiner that he knows how to do so, and that he is aware what precautions have to be taken in regard to water in the cylinder, &c. It is most important that a candidate should show that, in the event of an accident depriving him of the assistance of engineers, he knows what to do to safely take his vessel to an anchorage, or to stop the engines and proceed under sail alone.

The examination of a mate in steam is the same as that of a master. The knowledge is not with reference to the mate's position. A mate may be examined, but such examination implies that the mate will one day be a master, when the possession of the knowledge will be an advantage to him in the discharge of his duties as master.

#### APPENDIX O.

The following is a reprint of

### INSTRUCTIONS TO EXAMINERS OF MASTERS AND MATES.

1. The Examiners already understand that they are to be very careful (in examining all applicants for Certificates of Competency) to satisfy themselves that the applicants understand the Rule of the Road at Sea, and should decline to pass every applicant who does not understand it.

2. As a serious misapprehension has, however, arisen in a recent case in which Sound Signals were being made by a steamer under way in thick weather, contrary to the express wording of Articles 12a and 19 of the Regulations, it is more than ever incumbent on Examiners not to pass any applicant unless the Examiner is satisfied that the applicant understands that the Signals named in Article 19 are purely optional, and are only allowed to be made in cases in which the weather is so clear that the ship making them has the other vessel in sight.

3. Any Master using these *optional* Sound Signals, even when the other vessel is in sight, does so in every case on his own

\* Printed at end of Engineers' Regulations, Exn. 1a.

responsibility ; but if he uses them when the other vessel is *not* in sight, he commits a very serious act of disobedience to the Regulations, and must abide the consequences of his illegal act.

4. Applicants must be made to understand that the compulsory Sound Signal which *must* be made by a steamer under way in a fog is a prolonged blast under Article 12a, and no other Sound Signal.

5. In examining an applicant on the application of Articles 12 and 13, the Examiner should, by answers to questions, ascertain that the applicant understands that it is his duty to go at a moderate speed in fog, while, as regards Article 24, the Examiner should impress on the applicant that an "ordinary precaution" to be observed in the navigation of a steam-ship in a fog is to get the way off his own vessel immediately he hears the Sound Signal of another steamer, and then he should go ahead very slowly, blowing the "prolonged blast" at intervals, and feeling his way until all danger of collision is passed.

#### APPENDIX P.

##### FORMS used in connection with the EXAMINATION and CERTIFICATES of MASTERS AND MATES.

Name of Form.	Initial Letters and Numbers.
Regulations relating to the Examinations of Masters and Mates.	Exn. 1
Masters' and Mates' Form of Application for Examination.	Exn. 2
Form of Application for Examination (Colours) ...	Exn. 2a.
Examination Paper, to be used in the examination of Second Mates.	Exn. 4
Ditto, to be used by all candidates when appearing for examination for the first time only.	Exn. 4a.
Ditto, Second Mates ... ...	Exn. 5
Ditto, Only and First Mates ... ...	Exn. 6
Ditto, ditto ditto ... ...	Exn. 6a.
Ditto, Masters, Ordinary ... ...	Exn. 7
Ditto, for adjustments of the Sextant ...	Exn. 9a.
Ditto, Examination in Chart (for Mates)...	Exn. 9c.
Ditto, (for Masters) ... ...	Exn. 9d.
Examiners' Report of Masters' and Mates' Examination	Exn. 14
Examiners' Authority for delivery of Certificate to successful candidate.	Exn. 16
Examiners' Certificate (Colours) ... ...	Exn. 16d.
Ditto authority for return of Fee to unsuccessful candidate (Colours).	Exn. 17a.
Ditto Report on Colours tests ... ...	Exn. 17b.
Application for renewed Certificate ... ...	Exn. 23
Deviation cards ... ...	Exn. 24
Napier's Diagram ... ...	Exn. 25
Examination paper on Cyclones on revolving storms ...	Exn. 32

BENGAL.

By the Honourable the Lieutenant-Governor of Bengal.

In accordance with Her Majesty's order in Council of the 29th June 1882, issued under section 8 of the Merchant Shipping (Colonial) Act, 1869.

Colonial Certificate of Competency

AS

MASTER.

QO

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the duties of MASTER in the Merchant Service, I do hereby, in pursuance of Act I of 1859, grant you this Certificate of Competency.

By order of the Government of Bengal,

this \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_.

Under-Signy, to the Govt. of Bengal.

Registered at the Office of the Post Office of Calcutta.

BENGAL.No. of Certificate

Address of Owner \_\_\_\_\_

Date and Place of Birth \_\_\_\_\_

Signature \_\_\_\_\_

This Certificate is given upon an ORDINARY EXAMINATION passed at \_\_\_\_\_ on the \_\_\_\_\_  
 day of \_\_\_\_\_ 18\_\_\_\_\_

Any MASTER or MATE who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic., cap. 63, sec. 23, to cancel or suspend Certificates.

N. B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.

Issued at the Port of Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_

BENGAL.



Government of Bengal.

By the Honourable the Lieutenant-Governor of Bengal.  
In accordance with Her Majesty's order in Council of the 29th June 1882, issued  
under section 8 of the Merchant Shipping (Colonial) Act, 1869.

Colonial Certificate of Competency

AS

FIRST MATE.

To

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil  
the duties of FIRST MATE in the Merchant Service, I do hereby, in pursuance of Act I of 1869, grant you this Certificate  
of Competency.

By order of the Government of Bengal,

this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
*(Signature)*

Under-Secy. to the Govt. of Bengal,  
Registered at the Office of the Post Officer of Calcutta.

BENGAL.**No. of Certificate**

*Address of Owner* \_\_\_\_\_  
*Date and Place of Birth* \_\_\_\_\_  
*Signature* \_\_\_\_\_

*This Certificate is given upon an ORDINARY EXAMINATION passed at* \_\_\_\_\_ *on the* \_\_\_\_\_  
*day of* \_\_\_\_\_ 18 \_\_\_\_\_

*Any MASTER or MATE who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic., cap. 63, sec. 23, to cancel or suspend Certificates.*

*N. B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.*

*I issued at the Port of Calcutta on the* \_\_\_\_\_ *day of* \_\_\_\_\_ 18 \_\_\_\_\_

BENGAL.

Government of Bengal. In accordance with Her Majesty's order in Council of the 29th June 1882, issued under section 8 of the Merchant Shipping (Colonial) Act, 1869.

**Colonial Certificate of Competency**

AS

**ONLY MATE.**

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the duties of ONLY MATE in the Merchant Service, I do hereby, in pursuance of Act I of 1859, grant you this Certificate of Competency.

By order of the Government of Bengal,

this \_\_\_\_\_ day of \_\_\_\_\_, 18\_\_\_\_.

Under-Secy. to the Govt. of Bengal.  
Registered at the Office of the Port Officer of Calcutta.

BENGAL

## No. of Certificate

Address of Owner

Date and Place of Birth

Signature

This Certificate is given upon an ORDINARY EXAMINATION passed at \_\_\_\_\_  
 on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.

Any MASTER or MATE who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic, cap. 83, sec. 23, to cancel or suspend Certificates.

N. B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.

Issued at the Port of Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.

BENGAL.

Government of Bengal.

By the Honourable the Lieutenant-Governor of Bengal.  
In accordance with Her Majesty's order in Council of the 29th June 1882, issued  
under section 8 of the Merchant Shipping (Colonial) Act, 1869.

Colonial Certificate of Competency

*as*  
SECOND MATE.

To

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the  
duties of SECOND MATE in the Merchant Service, I do hereby, in pursuance of Act I of 1859, grant you this Certificate  
of Competency.

By order of the Government of Bengal,  
this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
Under-Secy. to the Govt. of Bengal.

Registered at the Office of the Post Office of Calcutta.

BENGAL.

## No. of Certificate

Address of owner \_\_\_\_\_  
Date and Place of Birth \_\_\_\_\_  
Signature \_\_\_\_\_

This Certificate is given upon an ORDINARY EXAMINATION passed at \_\_\_\_\_ on the \_\_\_\_\_ day of 18 .

Any MASTER or MATE who fails to deliver up a certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic., cap. 63, sec. 23, to cancel or suspend Certificates.

N.B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.

Issued at the Port of Calcutta on the \_\_\_\_\_ day of 18 .

No. 26 Marine, dated Calcutta, the 31st January 1890.

NOTIFICATION—By the Govt. of Bengal, P. W. Dept.

UNDER the powers conferred upon him by section 10 of Act I of 1859, and with the sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to make the following rules for the examination of persons desirous of obtaining local certificates of competency as Masters and Mates in the Mercantile Marine. These rules supersede those contained in the Notification of the General (Marine) Department of this Government, dated the 28th August 1877, and published in the *Calcutta Gazette* of the 29th idem.

Certificates granted to persons who pass examinations.

Examinations continued till all the Candidates are examined.

Notice of application for examination to be given to the Port Officer.

Testimonials of character, conduct and ability required.

Testimonials of Foreigners.

Certificates as to Age.

Foreigners to know English.

Verification of Services by the Port Officer.

1. Certificates of Competency will be granted to those persons who pass the requisite examinations and otherwise comply with the requisite conditions. For this purpose examiners have been appointed, and arrangements have been made for holding the examinations periodically at the Port of Calcutta. The examinations will be held twice a quarter or at such other times as the Government may appoint.

2. The examinations will commence early in the forenoon, and will be continued from day to day until all the candidates whose names appear upon the Port Officer's list on the day of examination are examined.

3. Candidates for examination must make their application upon the appropriate Form (Exn. 2), which must be filled up at the Port Office. The Exn. 2, properly filled in, together with the Candidate's testimonials and discharges, must be lodged with the Port Officer of Calcutta, not later than the day before the day of examination, and the Candidate must conform to any regulations in this respect which may be laid down by the Government; as, if this be not done, delay may be occasioned.

4. Testimonials of character, and of sobriety, experience, ability, and good conduct on board ship for at least the twelve months of service immediately preceding the date of application to be examined, will be required of all applicants, and without producing them no person will be examined. As such testimonials and discharges have to be verified before the Candidate can be examined, it is desirable that they should be handed in together with the Form Exn. 2 as early as possible.

5. The testimonials of servitude of Foreigners and of British seamen serving in foreign vessels, which cannot be verified by the Port Officer, must be confirmed either by the Consul of the country to which the ship in which the Candidate served belonged, or by some other recognized official authority of that country, or by the testimony of some credible person on the spot having personal knowledge of the facts required to be established. The production, however, of such proofs will not of necessity be deemed sufficient. Each case will be decided on its own merits, and if the sufficiency of the proofs given appears to be at all doubtful, it must be referred to the Government.

6. Should any doubt exist as to the age of a Candidate, he will be required to produce a certificate of birth or baptism.

7. Foreigners must prove to the satisfaction of the Examiners that they can speak and write the English language sufficiently well to perform the duties required of them on board a British vessel. In the case of natives of India, who may not be able to speak English, their Certificates shall be endorsed to the effect that they are only valid for vessels manned and officered entirely by Asiatics.

8. The time for which length of service as Seaman or Officer in the Mercantile Marine is to be reckoned in all cases referred to in the following paragraphs is to commence at the date when the articles of agreement were signed by the applicant, and to end at the date when he was discharged as shown in the articles of agreement. The certificates of discharge will generally be sufficient evidence of this, but great care must be exercised by the Port Officer and Examiners to detect any tampering in any way with the information contained in them, and to report to the Government at once any suspicious cases.

9. Services which cannot be verified by proper Entries in the Articles of the Ships in which the Candidates have served cannot be counted. For instance, a man will state his service to have been as Second or Only Mate, and to support his assertion will produce a Certificate of Discharge or of Employment by the Master to the effect that he served as Mate, when, on reference to the articles, it appears that he has actually been rated as Boatswain: the service in such a case will not be regarded as having been in the capacity of Mate.

10. Time for which Indentures of Apprenticeship are in force will be accepted as sea service, provided that the Apprentice has remained by the ship for at least four-fifths of the time covered by the Indentures, and that the Indentures of the applicant are endorsed by the Owner or Master to whom he has been bound to the effect that he has performed his service faithfully for the whole time agreed upon.

12. Service as Second, Third, or Fourth Mate may be accepted as equivalent to service as First or Only Mate to qualify a Candidate for examination for a Master's Certificate of Competency, provided he can produce satisfactory evidence of his having served at sea 12 months as Second, Third, or Fourth Mate of a Foreign-going Ship while in possession of a First Mate's Certificate of Competency, valid in the United Kingdom. It will be noted that occasional service in charge of a watch in the daytime will not be accepted as Mate's service under the Regulations.

13. Part of the time served on board a training ship will be allowed to count as service at sea, provided that the Candidate can produce amongst his testimonials a Certificate from the Committee that he has conducted himself creditably, and passed a good examination in seamanship so far as practised in the training ship as well as in other matters down to the time of his leaving the ship.

14. No period of service on board a training ship will be allowed to count for more than one year's sea service.

15. Candidates whose services have been in capacities other than Apprentice, Ordinary Seaman, or Able Seaman, e.g., Cook, Steward, Carpenter, &c., will be required to satisfy the Port Officer that they have a good knowledge of Seamanship. This may possibly be proved by the production of satisfactory Certificates from Masters with whom the applicants have served. Failing satisfactory evidence, the applicant may be required to perform additional service, which must be in the capacity of Ordinary Seaman or Able Seaman.

16. Service performed on rivers, no matter of what size, or in smooth water or partially smooth water limits, cannot be accepted.

17. A person who has lost the sight of one eye cannot be permitted to be examined for a Certificate of Competency. If he already holds a Certificate, he cannot be examined for a Certificate of a higher grade.

18. Service in Light-ships or in an Engine-room will not be accepted as sea service for a Master's or Mate's Certificate of Competency.

19. Service as a First Class Pilot will be accepted as qualifying for examination for a Master's Certificate for Home Trade Ships, notwithstanding that he may not have served in the capacity of Mate, but only provided that his Sea Services are sufficient. For the purpose of this rule, a Hooghly Master Pilot will be held to be a First Class Pilot.

20. Half the amount of service performed as an Apprentice in a Pilot Ship propelled by sails may count as actual Sea Service to qualify for examination for a Certificate of Competency.

21. Service performed in Tug Boats employed in Sand-heads Service or outside Port limits may be accepted as Sea Service for qualifying for a Mate's Certificate for Home Trade Ships. Service on Hooghly River survey vessels may be accepted on the same conditions. Service in the Hooghly Pilot vessels at the Sandheads is Sea Service.

22. Candidates who have neglected to join their vessels after having signed Articles, or who have deserted their vessels after having joined, or who have been found guilty

of gross misconduct on board, will be required to produce satisfactory proofs of two years' subsequent service and good conduct at sea, unless the Government, after having investigated the matter, should see fit to reduce the time.

If after passing examination services are found to have been insufficient.

Certificate of a lower grade may be granted on certain conditions.

Must be re-examined for certificate of higher grade.

23. If after a Candidate has passed his Examination it is discovered on further investigation, e.g., by verification on the part of the Port Officer, that his services are insufficient to entitle him to receive a Certificate of the grade for which he has passed, it will not be granted to him; but if the Government are satisfied that the error in the calculation of his services did not occur through any fault or wilful misrepresentation on his part, he will be allowed to go up for re-examination without payment of a further fee when he has performed the amount of service in which he was deficient.

24. If in such a case the applicant's services are sufficient to entitle him to receive a Certificate of a lower grade, provided as aforesaid he has not wilfully misrepresented the amount of his services, an Inferior Certificate may be granted to him, and the difference, if any, between the fee paid by him for the Superior Certificate and the fee payable for the Inferior Certificate, may be placed to his credit.

25. In such a case, when the applicant has by further service made up the amount in which he was found to be short, he must, before he can receive the higher Certificate, be re-examined in all the subjects.

#### Colour Tests.

26. The Local Government have made the following arrangements for the examination of persons as to their ability to distinguish colours :—\*

27. Examinations in Colour are open to any person serving or about to serve in the Mercantile Marine.

28. Any person, including the holders of Certificates of Competency, or persons about to apply for Certificates of Competency, if desirous of being examined *in Colours only*, must make application to the Port Officer on Form Exn. 2<sup>a</sup>, and pay a fee of one rupee.

29. He must on the appointed day attend for examination at the Examiner's Office; and if he passes he will receive a certificate to that effect.

30. If he fails it will be open to him to be examined again in Colours as often as he pleases on payment of the fee of one rupee at each fresh attempt.

31. The application of a Candidate who is presenting himself for Examination for a Master's or Mate's Certificate must be made on Form Exn. 2. Such examination will commence with the Colour test; and if the Candidate does not, at the time of making application, hold a Certificate of Competency of any grade, and should fail to distinguish correctly any of the colours used in the test, he will not be allowed to proceed with the examination in Navigation and Seamanship.

32. The fee he has paid for Examination for a Certificate of Competency will include the fee for the Colour test, and, with the exception of one rupee, will in such event be returned to him.

33. A Candidate for Examination for a Certificate of Competency who, at the time of making application, does not possess a Certificate, and who fails to pass the Colour test, may not be re-examined until after the lapse of three months from the date of his first failure. If he fails a second time, he will be allowed a third trial at the expiration of another three months from the date of his second failure. A fresh fee must be paid at each succeeding examination.

34. It is therefore obviously to the advantage of Candidates for Certificates of Competency to apply in the first instance to be examined in *Colours only* on Form Exn. 2<sup>a</sup>.

35. A Candidate who holds a Certificate of Competency, and who, on presenting himself for Examination for a Certificate of a higher grade, is unable to pass the Colour test, will notwithstanding be permitted to proceed with the Examination in Navigation and Seamanship for the Certificate of the higher grade.

\* See Appendix O.

36. Should he pass this examination, the following statement will be written on the face of the higher Certificate which may be granted to him, viz.—“ This Officer has failed to pass the Examination in Colours.”

37. Should he ultimately fail to pass the Examination in Navigation and Seamanship, a like statement, relating to his being Colour blind, will be made by the Port Officer on his existing Certificate before it is returned to him.

38. Holders of Certificates which bear the statement of their having failed to pass in Colours, and who may desire to have the statement removed from their Certificates, must obtain the special permission of the Government.

#### Qualifications for Certificates of Competency for a Home Trade Ship.

40. All Candidates for Certificates of Competency must first be examined in Colours.\*

41. A MATE must be not less than 19 years of age, and have served four years at sea.

No candidate will be allowed to be examined unless he has served two years at sea within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.

42. IN NAVIGATION, &c.—He must write a legible hand, and understand the first five rules of arithmetic, both simple and compound. He must be able to take a bearing by compass, and be conversant with the use of Mercator's chart, and be able to find, on either a “true” or “magnetic” chart,† the course to steer, and the distance from one given position to another; to find the ship's position on the chart from cross bearings of two objects; from two bearings of the same object, the course and distance run between taking the bearings being given; and the distance of the ship from the object at the time of taking the second bearing.

43. He must also pass an examination in the International Code of Signals.‡

44. IN SEAMANSHIP, &c.—He must possess a thorough knowledge of the rule of the road as regards both steamers and sailing vessels, their regulation lights, and fog and sound signals.§ He must be able to describe the signals of distress, and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals;|| also the use and management of the rocket apparatus in the event of his vessel being stranded. He must be able to mark and use the lead and log lines, to moor and unmoor a vessel, and to manage a ship's boat in heavy weather, &c., &c. He must also understand the construction, use, and action of the bulkhead sluices, the engine-room telegraph, &c., and to answer any other questions of a like nature appertaining to the duties of the Mate of a Home Trade Vessel which the Examiners may think proper to put to him.

45. A MASTER must be not less than 20 years of age, and have served five years at sea, of which one year must have been as First or Only Mate in the Home or Foreign Trade, during which service he must have been in possession of a Mate's Certificate for Home Trade Ships or of a First or Only Mate's Certificate for Foreign-going Ships. *Vide also para. 19.*

No candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

\* See Appendix F.

† See Appendix D. The terms “true” and “magnetic” are used throughout the Regulations for the sake of brevity and convenience for indicating charts that have compasses engraved upon them, showing the “true” or “magnetic” point of the compass respectively.

‡ See Appendix A.

§ See Appendix B.

|| See Appendix C.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.

46. IN NAVIGATION, &c.—In addition to the qualifications required of a Mate of a Home Trade Ship, a Master will be required to find on a chart the course to steer by compass in order to counteract the effect of a given current, and to find the distance the ship will make good towards a given point in a certain time, and to *work out practically* the correction to apply to soundings taken at a given time and place, to compare with the depth marked on the chart,\* &c. He will also be required to understand the use of the quadrant, to be able to observe with it, to read off and on the arc, and to find the index error by the horizon. He will also be required to find the latitude by a meridian altitude of the sun, and to give written answers (*vide supplementary vivâ voce test, page 40*) to certain practical questions on the subject of the deviation of the compass.†

47. IN SEAMANSHIP, &c.—In addition to the qualifications required of a Mate of a Home Trade Ship, a Master must understand how to rig a sea anchor, and what means to apply to keep a steamer with machinery disabled out of the trough of the sea, &c. How to get a cast of the lead in heavy weather, &c. He will be examined as to his resources for the preservation of the crew and passengers in the event of wreck, and the steps to be taken if his vessel is disabled and drifting towards a lee shore, and will be required to answer any other questions appertaining to the management of Home Trade Vessels which the Examiner may think necessary to put to him.

#### Failure.

R-examination  
in case of failure.

48. In all cases of failure the Candidate must be examined *de novo*. If a Candidate fails in *Seamanship*, he will not be re-examined until after a lapse of SIX MONTHS. Whether the whole or part of this period must be served at sea must depend upon the subjects in *Seamanship* in which the Candidate failed, but what amount (if any) of sea service will be required will be left to the discretion of the Port Officer, subject, however, to revision by the Government should they see fit.

49. The Examiners in making out their Report on Form Exn. 14 should state what amount (if any) of further sea service the Candidate must perform, and they should also insert this information under Division H in Form Exn. 2.

50. If he fails three times in *Navigation* he will not be re-examined until after a lapse of THREE MONTHS from the date of the *last failure*.

Certificate of a  
lower grade.

51. If a Candidate has failed in his Examination, but the subjects in which he has failed are not included in the subjects required for a certificate of a lower grade, he may, if he desires it, receive a certificate of such lower grade.

52. No part, however, of the fee he has paid will be returned to him, and on presenting himself, when entitled, for re-examination for the higher grade of Certificate he will be required to pay a further full fee.

53. If a Candidate fails for bad spelling or writing, he will not be re-examined until after a lapse of at least three months.

#### Fees.

54. Candidates for examination, in making their application on Form Exn. 2, will be required to pay the examination fee before any step is taken, whether by enquiring into their services or testing their qualifications, &c. Should it be found that their service is not sufficient to entitle them to be examined, or should their testimonials be unsatisfactory, or should they from any other cause, except failure to pass the colour tests, not be examined, no part of the fee will be returned to them, but when they have fulfilled the requisite service, or are able to produce satisfactory testimonials, as

\* See Appendix D.

† See Appendix E.

the case may be, they will be allowed to again present themselves for examination for a Certificate of the same grade without paying any further fee.

55. The fee for examination must be paid to the Port Officer. In any case in which a Candidate offers money to any other officer, and in any place but in the Port office, the Candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be again examined for twelve months.

56. If a Candidate fail in his examination, *no part of the fees he has paid will be returned to him.*

57. The fees are as follow:—

Fees to be paid by applicants for examination.  
133.

FOR "HOME TRADE SHIPS."

	Rs.
Mate ... ... ... ...	6
Master ... ... ... ...	12
For the renewal of any certificate ...	5

General Instructions to Examiners and Candidates.

58. All instruments necessary for use in the examinations are supplied by the Government.

Instruments used in examinations.

59. Before commencing the examination, the tables or desks must be cleared of all scraps of paper or books that are not used in the examination, and care should be taken that the candidates do not bring into the examination room any book, paper, document, or memoranda of any description whatever. No person whatever should be allowed in the room during the time of examination, but those whose duties require them to be present.

Prohibited books and papers.

60. No instructors will be allowed on the premises.

61. Candidates will under no pretence whatever be allowed to leave the premises while the examination is proceeding. If a candidate has occasion to visit the retiring room, he will only be allowed to do so on the completion of the paper on which he may be engaged, when he will be required to enter in a book kept for the purpose the exact times of his leaving and returning to the examination room. When only a few candidates are under examination, two persons will not be allowed to leave the room at the same time.

Candidates not to leave premises during examination.

62. Candidates should be so placed as to prevent one copying from the other, and no communication whatever between the Candidates should be allowed.

Position of Candidates at examination.

63. If any blotting paper is allowed, it should be black; and when the first examination paper is issued, each Candidate should be furnished with a piece, which must be returned to the Examiner upon the completion of the last paper.

Blotting paper.

64. The examination papers should be issued to the Candidates in half sheets only, and one at a time. This will prevent a Candidate from spreading out the sheets on the table in an apparently careless manner, but so as to enable his nearest neighbour to look over and copy, or examine the problems. It will also enable the Examiner to look over and report upon the work on one half sheet, while the Candidate is at work upon another, and so on. When the errors are not too numerous, or when they are not from ignorance of the subject, the incorrect problems may be returned to the Candidate for correction, but in no case should the errors be pointed out by the Examiner, neither should any marks be made on the correct work of the problem, which would at once indicate how far or to what extent the work is correct. Should the problems be returned to the Examiner the second time incorrect, this would be a failure; and as the time allowed is considered ample for working out the papers carefully, this rule is expected to be strictly observed.

How examination papers should be issued.

65. When from the large number of the candidates it may be found impossible to look over the work on the day of examination during the office hours, an hour in the morning of the following day may be allotted for the purpose of correcting the problems, but

In certain cases problems may be corrected on morning following examination day.

in no case should a Candidate have his problem returned to him for correction after he has made the second attempt.

*Vivid voce examination.*

66. In the *vivid voce* examination a reasonable time should be allowed for the Candidate to give his answers. No assistance should be given or leading question put.

*Minor corrections.*

67. All outstanding or minor corrections should appear in the margin of each problem paper; also on the chart papers Exn. 9C and Exn. 9D; and unless all these corrections appear on the papers of the Candidate, they will not be considered complete.

*Examination to commence with that for Second Mate.*

68. In every case the examination, whether for Only Mate, First Mate, Master, is to commence with the problems for Second Mate.

*Problems required as tests.*

69. Examiners should bear in mind that the problems to be performed are required as tests, and for the purposes of an Examination, and not for sea-going or practical purposes alone.

70. The Candidates will be allowed to work out the various problems according to the method and the tables they have been accustomed to use.

*Time allowed for Problems and Writings.*

71. The rules as to the amount of time allowed are as follow :—

*Additional time allowed in special cases.*

72. Candidates for *Home Trade Mate's Certificates* must complete the whole of their arithmetical and chart papers within *eight hours*, and Candidates for Home Trade Masters' Certificates within *ten hours*.

73. Punctually at the expiration of the prescribed time all the papers should be called up, whether completed or not, and if not completed the Candidate will be declared to have failed, unless the Examiner see fit to lengthen the period in any special case. If, however, the period is lengthened in any case, the special circumstances of that case, and the reasons for lengthening the period, together with the time allowed, must be reported to the Government by the Examiner, in the column for "remarks" on the Form Exn. 14. It should be noted that the periods prescribed in the foregoing paragraphs are not intended to include the time occupied by the *vivid voce* part of the examination.

74. It is anticipated that but few of the Candidates for Certificates of Competency will require the whole of the time herein allowed for completing their examination in navigation; and ample time has been prescribed, so that Candidates may perform their work in a careful, clear and legible manner, and to the entire satisfaction of the Examiners.

*Supplementary vivid voce Examination on written Papers.*

75. An impression prevails in regard to the examination of Masters and Mates, that so long as a Candidate can commit to paper correct answers to the various questions requiring written answers (*e. g.*, Forms Exn. 4a, Exn. 7, Exn. 9a, Exn. 9c, Exn. 32, &c.), no matter how indicative the answers may be of their having been learnt off by rote *only*, the duty and responsibility of the local Examiners are at an end, and that they have no power or authority to reject a Candidate should his written answers be correct.

76. Lest, therefore, such an impression should prevail, the Government wish to point out that Candidates for Certificates of Competency are not only expected to give correct written answers, which may merely be learnt off by rote, but they are expected to possess an intelligent knowledge of the various subjects prescribed in the Regulations, particularly as regards the important subject of the Deviation of the Compass.

77. This result may be easily attained by the Examiner putting a few *vivæ voce* questions to the candidate as the papers are brought up for inspection, or at any subsequent time if more convenient. The oral questions (suggested by the printed questions and the answers given) should be such that the Examiner may satisfy himself that the candidate possesses a real knowledge of what he has written, and should be confined strictly to the subjects of the printed questions. Should the candidate then exhibit ignorance of the subjects, the Examiner (who is in a position to judge of the real knowledge the man before him possesses) should deal with him at his discretion, notwithstanding that the candidate may have written all the answers correctly by rote.

78. When an Examiner finds it necessary to fail a Candidate in this supplementary *vivæ voce* test, a memorandum containing the particulars of the points on which the candidate was ignorant, *i.e.*, the identical questions and the identical answers given, must in each case be attached to his examination papers, when forwarded in the usual course to the Port Officer, or the particulars may be set forth by the Examiner in the margins of the candidate's papers in red ink.

79. If the Candidate passes he will receive the Form Exn. 16. upon which the Government will issue the certificate to the Candidate, whose testimonials, &c., will be returned at the same time.

Form Exn. 16.  
Completion of  
examination.

#### Special Notice to Candidates.

80. The attention of Candidates is specially called to the following Regulations:—

81. Candidates are required to appear at the examination-room punctually at the time appointed.

82. Candidates are prohibited from bringing into the examination-room books, paper, or memoranda of any kind whatever. The slightest infringement of this regulation will subject the offender to all the penalties of a failure, and he will not be allowed to present himself for re-examination for a period of three months.

83. In the event of any Candidate being detected in defacing, blotting, writing in, or otherwise injuring any book or books belonging to the Government, the papers of such Candidate will be detained until the book or books so defaced be replaced by him. He will not, however, be at liberty to remove the damaged book, which will still remain the property of the Government.

84. In the event of any Candidate being discovered referring to any book or memoranda, copying from another, or affording any assistance or giving any information to another, or communicating in any way with another, during the time of examination, he will subject himself to all the penalties of a failure, and he will not be allowed to be examined for a period of six months.

85. No Candidate will be allowed to work out his problems on a slate or on waste paper.

86. No Candidate will be permitted to leave the room until he has given up the paper on which he is engaged.

87. Any Candidate who may be guilty of insolence to the Examiner or of other misconduct will render himself liable to the postponement of his examination, or, if he has passed, to the detention of his certificate for such period as the local Government may direct.

#### General.

88. Certificates of competency will be made and issued in the forms hereunto annexed.

89. Every Certificate of Competency shall be made in duplicate, and one copy shall be delivered to the person entitled to the Certificate, and the other shall be kept and recorded by the Port Officer of Calcutta.

90. No application from the holder of a certificate granted by the Government of Bombay to be examined for a certificate of the same legal value shall be entertained.

## APPENDIX A.

EXAMINATION OF MASTERS AND MATES IN THE  
INTERNATIONAL CODE OF SIGNALS.

## INSTRUCTIONS TO EXAMINERS.

The Government desire to direct the attention of the Examiners to the principal points connected with the International Code of Signals (which is to be treated as a subject in Navigation) as to which Candidates for Examination should be questioned in order to qualify for Certificates of Competency.

The Government would recommend to the Examiners a perusal of the *Report of the Signal Committee of 1855* (which will be found at the commencement of the Signal Book), and also the *first few pages of the Book*. The information therein given will be found sufficient to make the Examiners theoretically acquainted with the characteristics of the Code, and the advantages it claims to possess over other Codes, and will enable them to appreciate and urge upon Candidates for Examination the facilities which this System of Signalling affords for easy and rapid communication.

The "comprehensiveness" and "distinctness" of the International Code are its chief recommendations.

The form of the Hoist generally indicates the nature of the Signal made, so that an observer can at sight understand the character of the Signal he sees flying.

The annexed plate gives examples which illustrate this.

The Examinations should tend to elicit a knowledge of the distinctive features of the Code above alluded to.

With this object the Examiners should make the 2, 3, and 4 Flag Signals on the Frame board which is furnished for the purpose (*always taking care first to show the Ensign and the Code Pennant at the Gaff*),\* questioning the Candidates as to the distinguishing Forms of the respective Hoists, (see Plate annexed), which will be indicated according as a Burgee, or a Pennant, or a Square Flag, is uppermost.

The Candidate ought to know how to find in the Signal Book the communication or the inquiry he desires to make, and how to make the Signal. The Signal to be made should *invariably* be sought for by the Candidate in the Vocabulary and Index, Part II, and never in Part I.

The Candidate ought to know how to interpret a Signal.

The Examiner should place a Signal on the Frame board, and vary the Signal by showing a 2 or 3 Flag Signal, or a "Geographical" or a "Vocabulary" Signal, or the name of a Merchant Ship or a Ship of War.

The two latter signals would not of course be found in the Signal Book. The Candidate ought to point them out in the *Code List of Ships*.

A Candidate ought to be able to read off a Signal at sight, so far as to name the Flags composing the Hoist.

He ought to know the use of the Code Pennant, and of the Pennants C. and D., "Yes" and "No."

The Candidate should be practised in the use of the Spelling Table, by being made to spell his own name, or some word not to the Vocabulary of the Code.

A knowledge of the Distant Signals should be required of the Candidate, their object and the mode of signalling by the Distant Code, which will be found at the end of the Signal Book.

For this purpose two Black Balls, two Black Square Flags, and two Black Pennants will be furnished with the Frame board, and the Candidate should be required to make one or two Distant Signals, and to read off one or two made by the Examiners.

The Ball being the distinguishing symbol of the Distant Signal, any Pennants or Flags of the Code may be employed in conjunction with it, irrespective of colour. The Black Pennants and Flags are merely sent as showing best in the light background of the Frame board.

The Examiners should be careful to ascertain that the Candidate possesses a knowledge of the Distress Signals which came into operation November 1st, 1873.

## SEMAPHORES.

A plate at the end of the Signal Book explains the method by which the arms of the Semaphore are made to represent by their position (up, down, or horizontal) the three symbols used for Distant Signalling, viz., a Flag, a Ball, or a Pennant. Before making Signals with the Semaphore, the Black Disc with the white rim should be placed on the top of the Semaphore Mast, as it properly forms a part of the Mast itself.

The International Code is used on board Her Majesty's Ships, and it has been adopted by all the principal maritime powers for their Imperial as well as for their Mercantile Navies.

*Note.*—The International Code of Signals, with the Code List, is prepared by the Registrar-General of Shipping and Seamen, and may be had of the Publishers, Messrs. Spottiswoode & Co.,

\* The object of this is, of course, to distinguish the signals from those of another Code.

## FLAGS OF THE INTERNATIONAL CODE OF SIGNALS.



N.B.—When used as the "Code Signal," this Pennant is to be hoisted under the "Ensign;" when used as the "Answering Pennant," where best seen.

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The following examples will serve to illustrate how the *form of a Hoist* will usually denote the *nature of the Signal* made:—

ONE FLAG.	TWO FLAGS.		THREE FLAGS.		FOUR FLAGS.			
	BURGER, uppermost, "ATTENTION" Signals.	PENNANT uppermost, "COMPASS" Signals.	SQUARE FLAG uppermost, "URGENT," Signals.	General Signals.	BURGER, uppermost, GEOGRAPHICAL Signals.	PENNANT C,D,F uppermost, NATIONAL VOCABULARY.	PENNANT G uppermost, Names of MEN-OF-WAR.	SQUARE FLAG uppermost, Names of MERCHANTSHIPS.

WHAT SHIPS HAVE "MARLBOROUGH" "MARCO POLO,"  
NO. 6026.  
YOU SPOKEN?  
SCREW-181 GUNS.

FALMOUTH.

54, Gracechurch Street, London, and the principal Booksellers at the various ports.

The Official Mercantile Navy List and Maritime Directory published for the use of Merchants, Shipowners, Shipbrokers, and others, may be obtained in like manner; price 12*s.*

## APPENDIX B.

### REGULATIONS RESPECTING LIGHTS AND FOG SIGNALS AND STEERING AND SAILING RULES ISSUED BY THE BOARD OF TRADE.

#### NOTICE.

The Board of Trade have had their attention drawn to the necessity of a more strict examination of applicants for Certificates of Competency in their knowledge of the regulations for preventing collisions at sea.

In order that the rule of the road at sea may be better understood, and that a uniform system of examination may prevail, the Board of Trade have issued the following catechism.

This catechism has received the approval of the Trinity House and Admiralty in England, and of the Council of the Admiralty of France.

The Board of Trade attach very great importance to a thorough knowledge of the steering and sailing rules on the part of every applicant for a Certificate of Competency, and a thorough examination on the part of the Examiners.

All applicants for examination, whether for certificates as masters or mates, are to be examined as to their knowledge of the steering and sailing rules each time they present themselves for examination.

Questions suggested by the following heads of examination are to be asked in addition to, and are not to supersede, any other questions proper and necessary to be asked by the Examiner.

The following questions need not be adhered to literally by the Examiner, and are not all to be asked; but the substance of the leading questions should be asked, and all that are asked should be satisfactorily answered, before an applicant is reported to have passed his examination. The Examiner should make such a selection of the questions as each case appears to him to require.

THOMAS GRAY,

*Board of Trade,*

*Assistant Secretary.*

*Marine Department.*

### HEADS OF EXAMINATION IN REGULATIONS RESPECTING LIGHTS AND FOG SIGNALS AND IN THE STEERING AND SAILING RULES.

1. What light or lights are required by the regulations to be exhibited by sailing vessels at anchor?

One light only, viz., a white light.

2. What light or lights are required by the regulations to be exhibited by steam-ships at anchor?

The same as for sailing vessels.

3. Where is the anchor light to be exhibited?

Where it can best be seen. It must of course be placed where there is the least possible chance of obstruction from spars, ropes, &c., &c.

4. To what height may the anchor light be hoisted?

It may be exhibited at any height where it can best be seen, not exceeding 20 feet above the deck.

5. What is the description of the lantern containing the anchor light required by the regulations?

A globular lantern of not less than eight inches in diameter.

6. In what direction or directions must the anchor light show?

It must show a clear, uniform, and unbroken light, visible all round the horizon.

7. At what distance must it be visible?

At least one mile.

8. What is the number of lights required by the regulations to be carried by sailing ships when under weigh at night?

Two side-lights, and to have in readiness a white light or a flare-up light to show from their stern to any vessel overtaking them.

9. Of what colour are these lights, and how are they to be placed on board the ship?

A green light on the starboard side, and a red light on the port side.

10. What description of light must be shown from the sides of sailing vessels under weigh; and over how many points of the compass, and in what directions, and how far, are they required to show?

Each light must be so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass;

so fixed as to throw the light from right ahead to two points abaft the beam on the starboard and port sides respectively; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles.

11. What lights are they to carry when being towed at night?

The same.

12. Are the side-lights required to be fitted with screens; and if so, of what length, and how?

Yes, on the inboard side; at least three feet in length, measuring forward from the light. They are to be so fitted as to prevent the coloured lights from being seen across the bows.

13. What is the number of lights required by the regulations to be carried by steam-ships when under steam at night?

Three lights, and to have in readiness a white light or flare-up light to show from their stern to any vessel overtaking them.

14. Of what colour are these lights, and how are they to be placed on board the ship?

A white light on or in front of the foremast at a height above the hull of not less than 20 feet; and if the breadth of the ship exceeds 20 feet, then at a height above the hull not less than such breadth. A green light on the starboard side, and a red one on the port side.

15. Over how many points of the compass, in what direction, and how far, is the foremast-head light of a steamer required to show?

Over 20 points, viz., from right ahead to two points abaft the beam on both sides. It must be of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least five miles.

16. Are the side-lights required to be fitted with screens; and if so, of what length?

The green and red lights are to be fitted with screens on the inboard side, extending at least three feet forward from the light, as in the case of sailing vessels.

17. Over how many points of the compass, in what directions, and how far, are the coloured side lights of steamers required to show?

The side-lights must be so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass, on each side of the ship, i.e., from right ahead to two points abaft the beam on the starboard and port sides respectively, and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles.

18. What description of lights are steamers required by the regulations to carry when they are not under steam, but under sail only?

Side-lights only, the same as sailing vessels.

19. What exceptional lights are to be carried by small sailing vessels in certain cases?

Whenever, as in the case of small vessels during bad weather, the green and red side lights cannot be fixed, these lights shall be kept on deck, on their respective sides of the vessel, ready for use; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side, nor the red light on the starboard side.

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

20. What description of lights are pilot vessels required to carry when on their stations on pilotage duty?

A pilot vessel, when engaged on her station on pilotage duty, shall not carry the lights required for other vessels, but shall carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

21. What description of lights are pilot vessels required to carry when not on their station on pilotage duty?

A pilot vessel, when not engaged on her station on pilotage duty, shall carry lights similar to those of other ships.

22. What lights are open boats and fishing vessels of less than 20 tons net registered required to carry when under way and not actually engaged in fishing?

Open boats and fishing vessels of less than 20 tons net registered tonnage, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the coloured side-lights; but every such boat and vessel shall in lieu thereof have ready at hand a lantern with a green glass on the one side and a red glass on the other side, and on approaching to, or being approached by another vessel, such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side, nor the red light on the starboard side.

23. What lights are fishing vessels and fishing boats of 20 tons net register, or upwards, required to carry when under way and not actually engaged in fishing?

They must carry similar lights to those of other ships when under way.

24. What lights are steam trawlers of 20 tons gross register, or upwards, whilst actually engaged in trawling, and not being stationary, required to carry?

All steam-vessels engaged in trawling must carry either one of the two following arrangements of lights, whichever of the two may be the more convenient:—

- (a) The usual green and red side-lights, and foremast head light, similar to those carried by other steamships; or
- (b) They must carry on or in front of the foremast head, and in the same position as the white light which other steamships are required to carry, a lanthorn showing a white light ahead, a green light on the starboard side, and a red light on the port side; such lanthorn shall be so constructed, fitted, and arranged as to show an uniform and unbroken white light over an arc of the horizon of four points of the compass, an uniform and unbroken green light over an arc of the horizon of 10 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 10 points of the compass, and it shall be so fixed as to show the white light from right ahead to two points on the bow on each side of the ship, the green light from two points on the starboard bow to four points abaft the beam on the starboard side, and the red light from two points on the port bow to four points abaft the beam on the port side: and (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform, and unbroken light all round the horizon; the lanthorn containing such white light shall be carried lower than the lanthorn showing the green, white, and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet, nor more than 12 feet.

25. What lights are sailing trawlers whilst actually engaged in trawling, and not being stationary, required to carry?

All sailing vessels, of whatever tonnage, whilst engaged in trawling, must carry either one of the three following arrangements of lights, whichever of the three, (a), (b), or (c), may be the most convenient:—

- (a) They may carry the green and red side-lights similar to those of other sailing ships; or
- (b) They may carry on or in front of the foremast head a lanthorn having a green glass on the starbord side and a red glass on the port side, so constructed, fitted, and arranged that the red and green do not converge, and so as to show an uniform and unbroken green light over an arc of the horizon of 12 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 12 points of the compass, and it shall be so fixed as to show the green light from right ahead to four points abaft the beam on the starboard side, and the red light from right ahead to four points abaft the beam on the port side; and (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform and unbroken light all round the horizon; the lanthorn containing such white light shall be carried lower than the lanthorn showing the green and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet and not more than 12 feet; or
- (c) They may carry a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform and unbroken light all round the horizon, and visible on a dark night, with a clear atmosphere, for a distance of at least 2 miles; and also a sufficient supply of red pyrotechnic lights which shall each burn for at least 30 seconds, and shall, when so burning, be visible for the same distance under the same conditions as the white light. The white light shall be shown from sunset to sunrise, and one of the red pyrotechnic lights shall be shown on approaching, or on being approached by, another ship or vessel in sufficient time to prevent collision.

26. What lights are vessels whilst actually engaged in drift net fishing required to carry?

All vessels when engaged in fishing with drift nets shall exhibit two white lights from any part of the vessel where they can be best seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 feet and not more than 10 feet; and so that the horizontal distance between them measured in a line with the keel of the vessel shall be not less than 5 feet and not more than 10 feet. The lower of these two lights shall be the more forward, and both of them shall be of such a character, and contained in lanterns of such construction as to show all round the horizon, on a dark night, with a clear atmosphere, for a distance of not less than 3 miles.

27. What lights are vessels whilst actually engaged in line fishing required to carry?

A vessel engaged in line fishing is required to carry the same lights as a vessel engaged in drift net fishing.

28. If a vessel, when fishing, becomes stationary in consequence of her gear getting fast to a rock or other obstruction, what signal must she make?

She must show the same light, and if a fog, mist, or falling snow prevail, she must make the same fog signal, as if she were at anchor.

29. What lights are fishing vessels and open boats required to exhibit when at anchor?

Between sunset and sunrise they must exhibit a white light, visible all round the horizon at a distance of at least one mile, the same as any other vessel.

30. What sound signals are fishing vessels required to make whilst engaged in fishing in thick weather?

In fog, mist, or falling snow, a drift net vessel attached to her nets, and a vessel when trawling, dredging, or fishing with any kind of drag net, and a vessel employed in line fishing with her lines out, shall at intervals of not more than two minutes make a blast with her fog-horn and ring her bell alternately.

31. May fishing vessels and open boats use flare-up lights, and if so, at what part, or parts, of the vessel should they be exhibited?

Yes. Fishing vessels and open boats may at any time use a flare-up in addition to the lights which they are by this article required to carry and show. All flare-up lights exhibited by a vessel when trawling, dredging, or fishing with any kind of drag net shall be shown at the after part of the vessel, excepting that, if the vessel is hanging by the stern to her trawl, dredge, or drag net, they shall be exhibited from the bow.

32. Do these regulations referring specially to fishing vessels and boats apply to foreign vessels, and to all parts of the world?

No, with the exception of the *first paragraph* of Article 10 of the regulations, they apply only to British vessels and boats when in the sea off the coast of Europe lying north of Cape Finisterre.

33. What lights are steam-ships required to carry when towing other ships?

A steam-ship, when towing another ship, shall, in addition to her side lights, carry two bright white lights in a vertical line one over the other, not less than three feet apart, so as to distinguish her from other steam-ships. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light which other steam-ships are required to carry.

34. What light is a ship which is being overtaken by another required to show?

A ship which is being overtaken by another shall show from her stern to such last mentioned ship a white light or a flare-up light.

35. Describe the lights and the day signals that vessels employed in laying or picking up a telegraph cable are required to carry.

A ship, whether a steam-ship or a sailing-ship employed in laying or in picking up a telegraph cable, shall at night carry in the same position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line over one another, not less than six feet apart; the highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character that the red lights shall be visible at the same distance as the white light. By day she shall carry in a vertical line one over the other, not less than six feet apart, in front of, but not lower than her foremast head, three shapes not less than two feet in diameter, of which the top and bottom shall be globular in shape and red in colour, and the middle one diamond in shape and white.

36. Describe the lights and the day signals that vessels which from any cause are not under command are required to carry.

A ship, whether a steam-ship or a sailing ship, which from any accident is not under command, shall at night carry, in the same position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three red lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over than other, not less than three feet apart, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles; and shall by day carry in a vertical line, one over the other, not less than three feet apart, in front of but not lower than her foremast head, three black balls or shapes, each two feet in diameter.

37. Are the above-mentioned ships to carry side-lights?

The above ships, when not making any way through the water, shall not carry the side-lights, but when making way shall carry them.

38. What are the previous mentioned shapes and lights intended to indicate to approaching ships?

These shapes and lights are to be taken by approaching ships as signals that the ship using them is not under command, and cannot therefore get out of the way.

39. Do these rules prevent squadrons and convoys from carrying special lights?

No. Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war, or for ships sailing under convoy.

40. What sound signals are steam-ships and sailing ships required by the regulations to be provided with?

A steam-ship shall be provided with a steam whistle or other efficient steam sound signal, so placed that the sound may not be intercepted by any obstructions, and with an efficient fog-horn to be sounded by a bellows or other mechanical means, and also with

an efficient bell. A sailing ship shall be provided with a similar fog-horn and bell.

41. When are these signals to be used?

In fog, mist, or falling snow, whether by day or night.

42. What sound signal is to be made by steam-ships and sailing ships when not under way?

A steam-ship and a sailing ship when not under way shall, at intervals of not more than two minutes, ring the bell.

43. What sound signal is required to be made by a steam-ship when under way?

A steam-ship under way shall make with her steam whistle, or other steam sound signal, at intervals of not more than two minutes a prolonged blast.

44. What sound signals are required to be made by sailing ships when under way?

A sailing ship under way shall make with her fog-horn, at intervals of not more than two minutes, when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abeam three blasts in succession.

45. Do the regulations require ships to take any other precaution during thick weather?

Yes. Art. 13 says every ship, whether a sailing ship or steamship, shall, in a fog, mist, or falling snow, go at a moderate speed.

46. Is it optional for a steam-ship to make any other signals with her steam whistle?

Yes; but only to vessels in sight, i.e., not to vessels which are so obscured by fog, mist, or falling snow that they cannot be seen, though their whistles may be heard.

Art. 19 provides that in taking any course authorised or required by the regulations, a steam-ship under way may indicate that course to any other ship which she has in sight by the following signals on her steam whistle, viz:—

One short blast to mean "I am directing my course to starboard."

Two short blasts to mean "I am directing my course to port."

Three short blasts to mean "I am going full speed astern."

The use of these signals is optional; but if they are used, the course of the ship must be in accordance with the signal made.

47. What precaution is to be taken by steamers approaching another vessel?

If there is risk of collision, the steamer is to slacken speed, or, if necessary, stop and reverse.

48. If you see two white lights in a vertical line one over the other, what do they denote as regards the vessel carrying them?

They denote the presence of a steamer towing with her side lights not within sight on account of distance, fog, &c.; or a vessel end on to me engaged in drift net fishing, or in line fishing or it may be a steam trawler end on, or within two points of being end on, to me.

49. If you see a green, or a red, light with a white light below, what do they denote?

They denote the presence of either a sailing, or a steam, vessel engaged in trawling.

50. If you see both the green and red lights with a white light below them, what do they denote?

They denote the presence of a sailing trawler coming end on to me.

51. If you see a white light alone, what does it denote as regards the ship carrying it?

It denotes the presence of a vessel or boat at anchor; or a pilot vessel on her station; or the mast-head light of a vessel, under steam, with her side-lights not within sight on account of distance fog, &c.; or a fishing vessel stationary through her gear getting fast to some obstruction, or a sailing trawler engaged in trawling (1) under one arrangement of lights heading so that her side-lights are obscured, (2) under another arrangement from the red pyrotechnic light not having been exhibited, or it may be a light shown from the stern of a vessel which is being overtaken.

52. If you see a green or a red light without a white light, or both a green and a red light without a white light, is the vessel carrying the light or lights seen, a vessel under steam or a vessel under sail?

A vessel under sail?

53. How do you know?

Because there is no white mast-head light.

54. If you see a white light over a coloured light, is the vessel a vessel under sail or a vessel under steam?

A vessel under steam. The mast-head light denotes that the vessel is under steam.

[The Examiner will then take one model of a vessel, which he will place on the table, and call it A. He will then take the mast or stand with a white and red ball on it and place it at the other end of the table and call it B.]

The Examiner should be careful that the model of one vessel only is used when the questions numbered 55 to 60 are asked.]

55. A is a steamer going north, seeing a white light and red light right ahead at B. Are A and the vessel B showing the two lights meeting end on or nearly end on, or is B passing A, or is B crossing the path of A, and in what direction, and how do you know?

Passing to port, because if I see a red light ahead, I know that the head of the vessel carrying that red light must be pointing away

in some direction to my own port or left hand. The ship showing the red light has her port or left side more or less open to A.

56. If A is going north, within what points of the compass must the vessel B showing the white and red lights be steering?

B must be going from a little W. of S. to W. N.-W.

57. How do you know this?

Because the screens being properly fitted, I could not see the red light of B at all with the vessel's head in any other direction.

58. A is a steamer going north, and seeing a white and green light ahead. Are A and B meeting, or is B passing A, or is B crossing the course of A, and in what direction; and how do you know?

B is passing to starboard of A, because if I see a green light ahead, I know that the head of the vessel carrying that green light must be pointing away in some direction to my starboard or right hand. The ship showing the green light has her right or starboard side more or less open to me.

59. As A is going north, within what points of the compass must the vessel showing the white and green lights be steering?

B must be going from a little E. of South to E.N.E.

60. How do you know?

Because the screens being properly fitted, I cannot see the green light at all with the vessel's head in any other direction.

61. If a steamer A sees the three lights of another steamer B ahead or nearly ahead, are the two steamers meeting, passing, or crossing?

Meeting end on, or nearly end on.

62. Do the regulations expressly require the course of a ship to be altered to starboard in any case, and if so, when?

Yes; in the case of two steamers meeting end on, or nearly end on.

63. Do they expressly require the course of a ship to be altered to starboard in any other case; and if so, in what other?

No. It is not in any other case expressly required by the regulations.

[The Examiner should see that the candidate puts the models in the positions indicated by the question 64, and following.]

64. If a steamer A sees another steamer's red light B on her own starboard side, are the steamers meeting, passing, or crossing; and how do you know?

Crossing, because the red light of one is opposed to the green light of the other; and whenever a green light is opposed to a red light or a red light to a green light, the ships carrying the lights are crossing ships.

65. Is A to stand on; and if not, why not?

A has the other vessel B on her own starboard side. A knows she is crossing the course of B, because she sees the red light of B on her (A's) own starboard side. A also knows she must get out of the way of B, because Article 16 expressly requires that the steamer that has the other on her own starboard side shall keep out of the way of the other.

66. Is A to starboard or to port in such a case?

A must do what is right so as to get herself out of the way of B: it is generally preferable to pass under a ship's stern rather than attempt to cross her bows, but it depends entirely on the position and relative speed of the two ships, and therefore the regulations wisely leave the giving way ship to get out of the way in any manner that may be most desirable, so always that she does get out of the way.

67. If A gets into collision by porting, will it be because she is acting on any rule?

No; the rule does not require her either to port or to starboard. If she ports, and gets into collision by porting, it is not the fault of any rule.

68. If a steamer A sees the green light of another steamer B on her own (A's own) port bow, are the two steamers meeting, passing, or crossing; and how do you know?

Crossing, because the green light of one ship is shown to the red light of the other.

69. What is A to do, and why?

By the rule contained in Article 22 of the Regulations, A is required to keep her course, subject only to the qualification that due regard must be had to all dangers of navigation; and that due regard must also be had to any special circumstances which may exist in any particular case rendering a departure from that rule necessary in order to avoid immediate danger. The crossing ship B on A's port side must get out of the way of A, because A is on B's starboard side.

70. A, a steamer, sees the green light of another steamer, B, a point on her A's port bow. Is there any regulation requiring A to port in such a case; and if so, where is it to be found?

There is not any.

71. Are steam-ships to get out of the way of sailing ships?

If a steamer and a sailing ship are proceeding in such direction as to involve risk of collision, the steamer is to get out of the way of the sailing ship, unless the sailing ship is overtaking the steamer.

72. What is to be done by A, whether a steamer or a sailing ship, if overtaking B?

A is to keep out of the way of B.

73. When by the rules one of two ships is required to keep out of the way of the other, what is the other to do?

To keep her course. This is absolutely necessary to enable the commander of the ship required by the regulations to keep out of the way, to act with decision and promptitude, which he cannot possibly, unless he knows what the other vessel is going to do.

74. Is there any qualification or exception to this?

Yes. Due regard must be had to all dangers of navigation, and to any special circumstances which may exist in any particular case, and require a departure from the regulations to avoid immediate danger.

75. Is there any general direction in the steering and sailing rules; and if so, what is it?

Yes, it is this: that nothing in the rules shall exonerate any ship, or the owner, master, or crew thereof, from the consequences of any neglect to carry lights, or signals, or of any neglect to keep a proper look-out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

76. Can you repeat article (—) of the regulations, I refer to the article containing the rule for (—)?

[The Examiner should repeat this question, naming a different article each time.]

77. What does the Act of Parliament provide as to the obligation of owners and masters in obeying the regulations respecting lights, fog signals, and steering and sailing?

Section 27 of "the Merchant Shipping Act Amendment Act, 1862," provides that owners and masters shall be bound to obey the regulations, and it also provides that in case of wilful default by the master or owner he shall be deemed to be guilty of a misdemeanor for each infringement.

78. What do breaches of the regulations imply?

If an accident happens through non-observance of the regulations, it implies wilful default on the part of the person in charge of the deck at the time, unless it is shown to the satisfaction of the court hearing the case that the special circumstances of the case rendered a departure from the rules necessary.

79. If collision ensues from a breach of the regulations, who is to be deemed in fault for the collision?

The person by whom the regulations are infringed, unless the court hearing the case decides to the contrary.

80. Is there any special rule for steam-ships navigating narrow channels?

In narrow channels every steam-ship shall, when it is safe and practicable, keep to that side of the fairway or mid-channel which is on the starboard side of such ship.

81. Do the regulations apply to sea-going ships in harbours and in rivers?

Yes; unless there is any rule to the contrary made by a competent authority.

82. Do they apply to British ships only?

No, to foreign ships as well, with the exception of paragraphs (a), (b), (c), (d), (e), (f) and (g), of Article 10, which apply only to British fishing vessels.

83. Do you know where the present regulations are to be found?

Yes, in the Orders in Council of the 11th August 1884, the 30th December 1884, and 24th June 1885. Copies are given away on application to the Board of Trade.

84. Is one ship bound to assist another in case of collision?

Yes.

85. What is the penalty for default?

If the master or person in charge of the ship fails to render assistance without reasonable excuse, the collision is, in absence of proof to the contrary, to be deemed to be caused by his wrongful act, neglect, or default.

86. Is there any other penalty attached to not rendering assistance?

Yes. If it is afterwards proved that he did not render assistance, his certificate may be cancelled or suspended by the court investigating the case.

87. Is it not expected that you should understand the regulations before you take charge of the deck of a ship?

It is.

88. Why?

If I do not understand them and am guilty of default, the consequences will be very serious to me.

89. What would be a serious offence?

To cause a collision by porting the helm or doing anything not required by the regulations and without due consideration.

#### REGULATIONS FOR PREVENTING COLLISIONS AT SEA, ORDER IN COUNCIL OF 11TH AUGUST 1884.

##### PRELIMINARY.

Art. 1. In the following rules every steam-ship which is under sail and not under steam is to be considered a sailing ship; and every steam-ship which is under steam, whether under sail or not, is to be considered a ship under steam.

##### RULES CONCERNING LIGHTS.

Art. 2. The lights mentioned in the following Articles, numbered 3, 4, 5, 6, 7, 8, 9, 10 and 11, and no others, shall be carried in all weathers, from sunset to sunrise.

**Art. 3. A sea-going steam-ship when under way shall carry—**

- (a) On or in front of the foremast, at a height above the hull of not less than 20 feet, and if the breadth of the ship exceeds 20 feet, then at a height above the hull not less than such breadth, a bright white light, so constructed as to show an uniform and unbroken light over an arc of the horizon of 20 points of the compass, so fixed as to throw the light 10 points on each side of the ship, viz. from right ahead to two points abaft the beam on either side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least five miles.
- (b) On the starboard side, a green light so constructed as to show an uniform and unbroken light over an arc of the horizon of 10 points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles.
- (c) On the port side, a red light, so constructed as to show an uniform and unbroken light over an arc of the horizon of 10 points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles.
- (d) The said green and red side-lights shall be fitted with inboard screens projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

**Art. 4. A steam-ship, when towing another ship, shall in addition to her side-lights, carry two bright white lights in a vertical line one over the other, not less than three feet apart, so as to distinguish her from other steam-ships. Each of these lights shall be of the same construction and character, and shall be carried in the same position, as the white light which other steam-ships are required to carry.**

**Art. 5. (a)** A ship, whether a steam-ship or a sailing ship, which from any accident is not under command, shall at night carry, in the same position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three red lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over the other, not less than three feet apart, and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles; and shall by day carry in a vertical line one over the other, not less than three feet apart, in front of, but not lower than, her foremast head, three black balls or shapes, each two feet in diameter.

**(b)** A ship, whether a steam-ship or a sailing ship, employed in laying or in picking up a telegraph cable, shall at night carry in the same position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over another, not less than six feet apart; the highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character that the red lights shall be visible at the same distance as the white light. By day she shall carry in a vertical line one over the other, not less than six feet apart, in front of, but not lower than, her foremast head, three shapes not less than two feet in diameter, of which the top and bottom shall be globular in shape and red in colour, and the middle one diamond in shape and white.

**(c)** The ships referred to in this Article, when not making any way through the water, shall not carry the side-lights, but when making way shall carry them.

**(d)** The lights and shapes required to be shown by this Article are to be taken by other ships as signals that the ship showing them is not under command, and cannot therefore get out of the way. The signals to be made by ships in distress and requiring assistance are contained in Article 27.

**Art. 6. A sailing ship under way, or being towed, shall carry the same lights as are provided by Article 3 for a steam-ship under way, with the exception of the white light, which she shall never carry.**

**Art. 7. Whenever, as in the case of small vessels during bad weather, the green and red side-lights cannot be fixed, these lights shall be kept on deck, on their respective sides of the vessel, ready for use; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent a collision, in such a manner as to make them most visible, and so that the green light shall not be seen on the port side, nor the red light on the starboard side.**

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

**Art. 8. A ship, whether a steam-ship or a sailing ship, when at anchor, shall carry, where it can best be seen, but at a height not exceeding 20 feet above the hull, a white light, in a globular lantern of not less than eight inches in diameter, and so constructed as to show a clear, uniform and unbroken light visible all round the horizon at a distance of at least one mile.**

**Art. 9. A pilot vessel, when engaged on her station on pilotage duty, shall not carry the lights required for other vessels, but shall**

carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

A pilot vessel, when not engaged on her station on pilotage duty, shall carry lights similar to those of other ships.

Art. 10. Open boats and fishing vessels of less than 20 tons net registered tonnage, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the coloured side-lights; but every such boat and vessel shall in lieu thereof have ready at hand a lantern with a green glass on the one side and a red glass on the other side, and on approaching to, or being approached by another vessel, such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side, nor the red light on the starboard side.

The following portion of this article applies only to fishing vessels and boats when in the sea off the coast of Europe lying north of Cape Finisterre:-

- (a) All fishing vessels and fishing boats of 20 tons not registered tonnage, or upwards, when under way and when not required by the following regulations in this article to carry and show the lights therein named, shall carry and show the same lights as other vessels under way.
- (b) All vessels when engaged in fishing with drift nets shall exhibit two white lights from any part of the vessel where they can be best seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 feet and not more than 10 feet; and so that the horizontal distance between them measured in a line with the keel of the vessel shall be not less than five feet, and not more than 10 feet. The lower of these two lights shall be the more forward, and both of them shall be of such a character, and contained in lanterns of such construction as to show all round the horizon, on a dark night with a clear atmosphere, for a distance of not less than three miles.
- (c) A vessel employed in line fishing with her lines out shall carry the same lights as a vessel when engaged in fishing with drift nets.
- (d) If a vessel when fishing becomes stationary in consequence of her gear getting fast to a rock or other obstruction, she shall show the light and make the fog signal for a vessel at anchor.
- (e) Fishing vessels and open boats may at any time use a flare-up in addition to the lights which they are by this article required to carry and show. All flare-up lights exhibited by a vessel when trawling, dredging, or fishing, with any kind of drag net shall be shown at the after part of the vessel, excepting that, if the vessel is hanging by the stern to her trawl, dredge, or drag net, they shall be exhibited from the bow.
- (f) Every fishing vessel and every open boat when at anchor between sunset and sunrise shall exhibit a white light visible all round the horizon at a distance of at least one mile.
- (g) In fog, mist, or falling snow, a drift net vessel attached to her nets and a vessel when trawling, dredging, or fishing with any kind of drag net, and a vessel employed in line fishing with her lines out, shall at intervals of not more than two minutes make a blast with her fog-horn and ring her bell alternately.

Art. 11. A ship which is being overtaken by another shall show from her stern to such last-mentioned ship a white light or a flare-up light.

#### SOUND SIGNALS FOR FOG, &c.

Art. 12. A steam-ship shall be provided with a steam whistle or other efficient steam sound signal, so placed that the sound may not be intercepted by any obstructions, and with an efficient fog-horn to be sounded by a bellows or other mechanical means, and also with an efficient bell.\* A sailing ship shall be provided with a similar fog-horn and bell.

In fog, mist, or falling snow, whether by day or night, the signals described in this Article shall be used as follows; that is to say—

- (a) A steam-ship under way shall make with her steam whistle or other steam sound signal, at intervals of not more than two minutes, a prolonged blast.
- (b) A sailing ship under way shall make with her fog-horn, at intervals of not more than two minutes, when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.
- (c) A steam-ship and a sailing ship, when not under way, shall, at intervals of not more than two minutes, ring the bell.

#### SPEED OF SHIPS TO BE MODERATE IN FOG, &c.

Art. 13. Every ship, whether a sailing ship or steam-ship, shall in a fog, mist, or falling snow, go at a moderate speed.

\* In all cases where the regulations require a bell to be used, a drum will be substituted on board Turkish vessels.

## STEERING AND SAILING RULES.

Art. 14. When two sailing ships are approaching one another so as to involve risk of collision, one of them shall keep out of the way of the other, viz.—

- (a) A ship which is running free shall keep out of the way of a ship which is close-hauled.
- (b) A ship which is close-hauled on the port tack shall keep out of the way of a ship which is close-hauled on the starboard tack.
- (c) When both are running free with the wind on different sides, the ship which has the wind on the port side shall keep out of the way of the other.
- (d) When both are running free with the wind on the same side, the ship which is to windward shall keep out of the way of the ship which is to leeward.
- (e) A ship which has the wind aft shall keep out of the way of the other ship.

Art. 15. If two ships under steam are meeting end on, or nearly end on, so as to involve risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other.

This article only applies to cases where ships are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two ships which must, if both keep on their respective courses, pass clear of each other.

The only cases to which it does apply are, when each of the two ships is end on, or nearly end on, to the other; in other words, in cases in which, by day, each ship sees the masts of the other in a line, or nearly in a line, with her own; and by night, to cases in which each ship is in such a position as to see both the side-lights of the other.

It does not apply, by day, to cases in which a ship sees another ahead crossing her own course; or by night, to cases where the red light of one ship is opposed to the red light of the other, or where the green light of one ship is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

Art. 16. If two ships under steam are crossing, so as to involve risk of collision, the ship which has the other on her own starboard side shall keep out of the way of the other.

Art. 17. If two ships, one of which is a sailing ship, and the other a steam-ship, are proceeding in such directions as to involve risk of collision, the steam-ship shall keep out of the way of the sailing ship.

Art. 18. Every steam-ship, when approaching another ship, so as to involve risk of collision, shall slacken her speed or stop and reverse, if necessary.

Art. 19. In taking any course authorised or required by these Regulations, a steam-ship under way may indicate that course to any other ship which she has in sight by the following signals on her steam whistle, viz.—

One short blast to mean "I am directing my course to starboard."

Two short blasts to mean "I am directing my course to port."

Three short blasts to mean "I am going full speed astern."

The use of these signals is optional; but if they are used, the course of the ship must be in accordance with the signal made.

Art. 20. Notwithstanding anything contained in any preceding Article, every ship, whether a sailing ship or a steam-ship, overtaking any other shall keep out of the way of the overtaken ship.

Art. 21. In narrow channels every steam-ship shall, when it is safe and practicable, keep to that side of the fairway or mid-channel which lies on the starboard side of such ship.

Art. 22. Where by the above rules one of two ships is to keep out of the way, the other shall keep her course.

Art. 23. In obeying and construing these rules due regard shall be had to all dangers of navigation; and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

## NO SHIP, UNDER ANY CIRCUMSTANCES, TO NEGLECT PROPER PRECAUTIONS.

Art. 24. Nothing in these rules shall exonerate any ship, or the owner, or master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look-out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

## RESERVATION OF RULES FOR HARBOURS AND INLAND NAVIGATION.

Art. 25. Nothing in these rules shall interfere with the operation of a special rule, duly made by local authority, relative to the navigation of any harbour, river, or inland navigation.

## SPECIAL LIGHTS FOR SQUADRONS AND CONVOYS.

Art. 26. Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with

respect to additional station and signal lights for two or more ships of war or for ships sailing under convoy.

Art. 27. When a ship is in distress, and requires assistance from other ships or from the shore, the following shall be the signals to be used or displayed by her, either together or separately, that is to say—

In the day-time—

1. A gun fired at intervals of about a minute;
2. The International Code signals of distress indicated by N. C.
3. The distant signal, consisting of square flag, having either above or below it a ball or anything resembling a ball.

At night—

1. A gun fired at intervals of about a minute;
2. Flames on the ship (as from a burning tar barrel, oil barrel, &c.);
3. Rockets or shells, throwing stars of any colour or description, fired one at a time, at short intervals.

#### ORDERS IN COUNCIL OF 30TH DECEMBER 1884 AND 24TH JUNE 1885.

##### ALTERNATIVE LIGHTS FOR TRAWLERS WHEN ENGAGED IN TRAWLING, HAVING THEIR TRAWLS IN THE WATER AND NOT BEING STATIONARY.

###### 1884.—PART I.—STEAM-VESSELS OF 20 TONS GROSS REGISTER TONNAGE OR UPWARDS.

(1) On or in front of the foremast head and in the same position as the white light which other steam-ships are required to carry, a lanthorn showing a white light ahead, a green light on the starboard side, and a red light on the port side, such lanthorn shall be so constructed, fitted, and arranged as to show an uniform and unbroken white light over an arc of the horizon of four points of the compass, an uniform and unbroken green light over an arc of the horizon of 10 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 10 points of the compass, and it shall be so fixed as to show the white light from right ahead to two points on the bow on each side of the ship, the green light from two points on the starboard bow to four points abaft the beam on the starboard side, and the red light from two points on the port bow to four points abaft the beam on the port side: (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, the lanthorn containing such white light shall be carried lower than the lanthorn showing the green, white, and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet nor more than 12 feet.

###### 1884.—PART II.—SAILING-VESSELS OF 20 TONS NET REGISTER TONNAGE OR UPWARDS.

(1) On or in front of the foremast head a lanthorn having a green glass on the starboard side and a red glass on the port side, so constructed, fitted, and arranged that the red and green do not converge, and so as to show an uniform and unbroken green light over an arc of the horizon of 12 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 12 points of the compass, and it shall be so fixed as to show the green light from right ahead to four points abaft the beam on the starboard side, and the red light from right ahead to four points abaft the beam on the port side: and (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, the lanthorn containing such white light shall be carried lower than lanthorn the green and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet and not more than 12 feet.

###### 1885.—SAILING TRAWLERS OF ANY TONNAGE.

As regards sailing vessels engaged in trawling, such vessels having their trawls in the water and not being stationary in consequence of their gear getting fast to a rock or other obstruction, if they do not carry and show the lights required by Article 6 of the Regulations aforesaid, or the other lights of the description set forth in Part 2 of the Schedule to the said recited Order in Council of the 30th of December 1884, shall carry and show in lieu of the lights required by Article 6 of the Regulations aforesaid, or the other lights of the description set forth in paragraph 2 of the Schedule to the said recited Order, other lights as follows, that is to say:

A white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, and visible on a dark night

with a clear atmosphere for a distance of at least 2 miles ; and also a sufficient supply of red pyrotechnic lights which shall each burn for at least 30 seconds, and shall, when so burning, be visible for the same distance under the same conditions as the white light. The white light shall be shown from sunset to sunrise, and one of the red pyrotechnic lights shall be shown on approaching, or on being approached by another ship or vessel in sufficient time to prevent collision.

AIDS TO MEMORY IN FOUR VERSES, BY THOMAS GRAY.

1. *Two Steam-ships meeting.*

When both side lights you see ahead—  
Port your helm and show your RED.

2. *Two Steam-ships passing.*

GREEN to GREEN—or, RED to RED—  
Perfect safety—Go ahead!

3. *Two Steam-ships crossing.*

*Note.*—This is the position of greatest danger : there is nothing for it but good look-out, caution, and judgment.

If to your starboard RED appear,  
It is your duty to keep clear;  
To act as judgment says is proper :—  
To Port—or Starboard—Back,—or, Stop her !  
But when upon your Port is seen  
A Steamer's Starboard Light of GREEN,  
There's not so much for you to do,  
For GREEN to Port keeps clear of you.

4. *All Ships must keep a good look-out, and Steam-ships must stop and go astern, if necessary.*

Both in safety and in doubt  
Always keep a good look-out;  
In danger, with no room to turn,  
Ease her, stop her, go astern.

14th October 1867.

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APPENDIX C.

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DISTRESS AND PILOT SIGNALS.

M. S. Act 1873.

The following sections, together with the schedules referred to therein, of the " Merchant Shipping Acts, Amendment Act, 1873," relate to Signals of Distress and Signals for Pilots. (See also " Regulations for preventing Collisions at Sea. Article 27.)

Signals of distress.

18. The signals specified in the first schedule to this Act shall be deemed to be signals of distress.

Any master of a vessel who uses or displays, or causes or permits any person under his authority to use or display, any of the said signals, except in the case of a vessel being in distress, shall be liable to pay compensation for any labour undertaken, risk incurred, or loss sustained in consequence of such signal having been supposed to be a signal of distress, and such compensation may, without prejudice to any other remedy, be recovered in the same manner in which salvage is recoverable.

Signals for pilots.

19. If a vessel requires the services of a pilot, the signals to be used and displayed shall be those specified in the second schedule to this A

Any master of a vessel who uses or displays, or causes or permits any person under his authority to use or display, any of the said signals for any other purpose than that of summoning a pilot, or uses or causes or permits any person under his authority to use any other signal for a pilot, shall incur a penalty not exceeding twenty pounds.

Power to alter rules as to signals.

20. Her Majesty may from time to time by Order in Council repeal or alter the rules as to signals contained in the schedules to this Act or make new rules in addition thereto, or in substitution therefor, and any alterations in or additions to such rules made in manner aforesaid shall be of the same force as the rules in the said schedules.

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SCHEDULES.

SCHEDULE I.—SIGNALS OF DISTRESS.

In the day time.—The following signals, numbered 1, 2 and 3, when used or displayed together or separately, shall be deemed to be signals of distress in the daytime :—

1. A gun fired at intervals of about a minute;
2. The International Code signal of distress indicated by N C;
3. The distant signal, consisting of a square flag having either above or below it a ball, or anything resembling a ball.

*At night.*—The following signals, numbered 1, 2 and 3, when used or displayed together or separately, shall be deemed to be signals of distress at night:

1. A gun fired at intervals of about a minute;
2. Flames on the ship (as from a burning tar barrel, oil barrel, &c.);
3. Rockets or shells, of any colour or description, fired one at a time, at short intervals.

SCHEDULE II.—SIGNALS TO BE MADE BY SHIPS WANTING A PILOT.

*In the day time.*—The following signals, numbered 1 and 2, when used or displayed together or separately, shall be deemed to be signals for a pilot in the day time, viz.—

1. To be hoisted at the fore, the Jack or other national colour usually worn by merchant ships, having round it a white border, one-fifth of the breadth of the flag; or
2. The International Code pilotage signal indicated by P T.

*At night.*—The following signals, numbered 1 and 2, when used or displayed together or separately, shall be deemed to be signals for a pilot at night, viz.—

1. The pyrotechnic light, commonly known as a blue light, every fifteen minutes; or
2. A bright white light, flashed or shown at short or frequent intervals, just above the bulwarks, for about a minute at a time.

APPENDIX D.

EXAMINATION IN CHART.

FOR ALL GRADES WHERE THE CHART IS USED (INCLUDING "HOME TRADE" CANDIDATES).

[The candidate will be required to work out the following questions on either a "true" or "magnetic" chart, \* whichever may be handed to him by the Examiner; and also determine whether the chart is a "true" or "magnetic" one, and whether it is for the northern or southern, and eastern or western hemispheres.

1. Using deviation [card] [curve] † No. find the course to steer by compass from to ; also the distance.

Answer.—Compass course .  
Distance .  
Variation .  
Deviation .

2. With the ship's head on the above-named compass course a [point] [light-house] bore by compass and bore by the same compass, find the ship's position.

Answer.—Latitude .  
Longitude .

3. With the ship's head as above, a [point] [light-house] bore by compass , and after continuing on the same course miles, it bore , find the position of ship and her distance from at the time of taking the second bearing.

Answer.—Latitude .  
Longitude .  
Distance .

All the foregoing questions must be answered, but this does not preclude the Examiner from putting any other questions of a practical character or which the local circumstances of the port may require.

Signature .  
Date .  
Chart used .

ADDITIONAL FOR MASTERS (INCLUDING "HOME TRADE" CANDIDATES).

4. Find the course to steer by compass from to (see Question 1) to counteract the effect of a

\* The terms "true" and "magnetic" are used for the sake of brevity, and convenience, for indicating charts that have compasses delineated upon them showing the "true" or "magnetic" points of the compass respectively.

† A candidate for a Master's Certificate is expected to use either a card of deviations, or a curve of deviations on a Napier's diagram, whichever the Examiner may think proper to put before him.

current which set                          at the rate of                          miles per hour, the ship making by log                          miles per hour; also the distance the ship would then make good in                          hours towards

Answer.—Compass course

Distance

6. On                          being off                          took a cast of the lead ; required the correction to be applied to the depth obtained by the lead line before comparing it with the depth marked on the chart.

6. What do you understand the small numbers to indicate that you see placed about the chart, and at what time of tide?

7. What do the Roman numerals indicate that are occasionally seen near the coasts and in harbours?

8. How would you find, approximately, the time of high water at any place, the Admiralty tables not being at hand nor any other special tables available?

All the foregoing questions, and those on Form Exn. 9 C., must be answered, but this does not preclude the Examiner from putting any other questions of a practical character or which the local circumstances of the port may require.

Signature

Date

#### APPENDIX E.

##### DEVIATION OF THE COMPASS.

(FOR MASTERS OF HOME TRADE SHIPS.)

[The Applicant must answer in writing, on paper given him by the Examiner, all the following questions, numbering his answers to correspond with the numbers of the questions.]

1. When taking a Meridian Altitude, how do you know when the sun is on the Meridian ; or, in other words, when it is noon?
2. How does the sun bear when on the meridian of an observer in these latitudes (Home Trade Limits)?
3. What do you mean by deviation of the compass, and how is it caused?
4. Having determined the deviation, how do you know when it is easterly, and when westerly?
5. Supposing the sun when on the meridian bore by your compass ————— what would be the deviation of that Compass for the direction of the ship's head at the time, the variation given on the Chart being ————— ?
6. How could you find the deviation of your Compass when in port, or when sailing along a coast?
7. Name some suitable objects by which you could readily obtain the deviation of your Compass, when sailing along the coasts of the Channel you have been accustomed to use?
8. The bearing of two objects when in a line with each other was found on the Chart to be ————— magnetic ; but when brought in a line on board they bore ————— by your Compass ; required the deviation of your Compass for the direction of the ship's head at the time?
9. What means are there for checking the deviation of your Compass by night?
10. Supposing the North Star (*Polaris*) bore ————— by your Compass, what would be the deviation (approximately) of that Compass for the direction the ship's head at the time, supposing the variation given on the Chart to be ————— ?
11. Do you expect the deviation to change? if so, state under what circumstances?
12. What is meant by variation of the Compass, and what is the cause of it?

#### APPENDIX F.

##### INSTRUCTIONS TO EXAMINERS.

###### EXAMINATION IN COLOURS.

Herewith are—

- (a) A lanthorn having in it a lamp in which kerosene is to be burnt.
- (b) A slide having ground glass in it.

(c) Nine slides, each having a coloured glass in it. The colours are as follow :—

1. Red (Standard).
2. Pink or salmon.
3. Green (Standard or No. 1..
4. Green (Bottle or No. 2).
5. Green\* (Pale or No. 3).
6. Yellow.
7. Neutral.\*
8. Blue (Standard).
9. Blue\*(Pale).

(d) Cards, five of each as follow :—

1. White
2. Black.
3. Red.
4. Pink\*
5. Green.
6. Drab.\*
7. Blue.
8. Yellow.

#### EXAMINATION BY DAYLIGHT. (CARDS.)

In conducting the examination by daylight the examiner should do it in three ways—

1. The cards should be mixed up. The examiner should then hold up each card separately, and ask the candidate to name the colour, and if the candidate does so without hesitation, he is to be regarded as having passed the day-light test.
2. If the candidate hesitates in any of his answers so as to raise a doubt in the mind of the examiner as to his ability to readily distinguish colours, the examiner should put all the cards on the table and require the candidate to select all cards of a colour or colours named by the examiner.
3. Having done that they should all be mixed up again and the candidate should be required to sort the cards into eight heaps, putting all of one colour into each heap
4. The result of the examination should be noted and recorded in each case.

#### EXAMINATION BY ARTIFICIAL LIGHT.

The room should be dark.

The lamp lighted and placed in the lanthorn.

The applicant should be seated or should stand so as to be opposite to the opening of the lanthorn; and, at least, 15 feet from the front of the lanthorn.

He should first of all see the light in the lanthorn without the interposition of any glass and be asked if it appears to him to have any colour, and if so, what colour?

The slide with the ground glass should then be put into the opening at the front of the lanthorn which is nearest to the light, and the applicant asked the same question.

The slide with the ground glass is to be left in, and the slides with the coloured glasses placed one by one and separately in front of it, and the candidate asked in each case to name the colour or tint.

The result of the examination should of course be noted and recorded in each case.

#### GENERAL.

The cards and glasses against which a star\* is placed in the list are what may be called confusion tints. The candidate is not to be regarded as having "failed" if he miscalls these tints, provided that he names all the others correctly. But if having named all the others correctly he miscalls these so far as to name the drab card No. 6 as red, pink, salmon, &c.; or so name card No. 7 as red, green, or yellow; or glass No. 2 as green blue, or yellow; or glass No. 5 as red, pink, salmon, &c.; or glass No. 7 as bright red or bright green; or the plain ground glass any colour, the case should be reported for record. In short, if the candidate's perception or impression of these tints does not agree with the perception of the examiner, the case should be reported on the Form Exn. 17a.

The only reasons for which a candidate is to be reported as having failed are inability to distinguish red from green, or either from black, by daylight; and red from green, or either from the ground glass, by artificial light.

If a candidate fails in the colour test when the ground glass is in the lanthorn (as it is always to be when the coloured glasses are shown), he may also be tried over again with the coloured glasses without the intervention of the ground glass, and the result noted and recorded.



Government of  
Bengal.

To the Honourable the Lieutenant-Governor of Bengal.

Local Certificate of Competency

<sup>48</sup>  
MASTER.

To

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the duties of Master in the \_\_\_\_\_ service, I do hereby, in pursuance of Act No. I of 1859 of the Legislative Council of India, grant you this CERTIFICATE OF COMPETENCY.

By order of the Government of Bengal,

Given under my Hand and Seal,

this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_. Under-Secy. to the Govt. of Bengal.

## No. of Certificate

*Bearer**Date and Place of Birth**No. of Register Ticket**Signature*

*Any MASTER or MATE who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500.*

*N.B.—Any person other than the owner thereof becoming possessed of this certificate is required to transmit it forthwith to the Port Officer, Calcutta.*

*Issued at Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
Registered.*

*Port Officer of Calcutta.*



Government of  
Bengal.

By the Honourable the Lieutenant-Governor of Bengal.

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Moral Certificate of Competency

A.S

MATE.

To

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the duties of \_\_\_\_\_ Mate in the \_\_\_\_\_ service,  
I do hereby, in pursuance of Act No. I of 1859 of the Legislative Council of India, grant you this CERTIFICATE OF COMPETENCY.

By order of the Government of Bengal,

Given under my Hand and Seal,  
this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_  
Under-Secy. to the Govt. of Bengal.

No. of Certificate

Bearer \_\_\_\_\_

Date and Place of Birth \_\_\_\_\_

No. of Register Ticket \_\_\_\_\_

Signature \_\_\_\_\_

*Any MASTER or MATE who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500.*

*N.B.—Any person other than the owner thereof becoming possessed of this certificate is required to transmit it forthwith to the Port Officer, Calcutta.*

Issued at Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_

Registered,

Port Officer of Calcutta.

## NOTICE.

Candidates applying to be examined for Certificates of Competency are hereby informed that no remuneration or gratuity whatever, either directly or indirectly, can be received by any Officer, Messenger, or Servant of the Government, except the lawful fees stated in the Regulations, which are to be paid to the Port Officer when the Candidate makes his application.

Any Officer, Messenger, or Servant of the Government accepting any present or gratuity is liable to summary dismissal, and any Candidate so offering money will be subject to the penalty mentioned in para. 16 of the Regulations relating to the examination of Masters, or para. 35 of those relating to the examination of Engineers and Engine-drivers as the case may be.

Every case in which an applicant has paid, or pays hereafter, any fee or gratuity to any Officer, Messenger, or Servant, on any pretence whatever, other than the prescribed fees for examination, should be reported to the Local Government.

W. B. BESTIC,

*Under-Secy. to the Govt. of Bengal.*

P. W. (Marine) Dept.

## REGULATIONS

RELATING TO THE

EXAMINATION OF MASTERS OF INLAND  
STEAM-VESSELS.

## Preliminary.

UNDER the provisions of the Inland Steam-Vessels Act, 1884, no inland steam-vessel having engines of eighty nominal horse-power or upwards is allowed to proceed on any voyage unless her master possesses a first class master's certificate granted under the Act, or a master's certificate granted under Act I of 1859 (*for the amendment of the law relating to merchant seamen*), or the Merchant Shipping Acts, 1854 to 1883, or a certificate to which the provisions of any such Act have been made applicable under the Merchant Shipping (Colonial) Act, 1869; and no such ship having engines of under eighty nominal horse-power is allowed to proceed on any voyage unless her master possesses a second class master's certificate granted under the Act, or a certificate of the higher grade of the nature referred to above:

Provided that a steam-vessel having engines of under eighty nominal horse-power shall be deemed to have complied with the law if she has as her master and engineer a person possessing both a second class master's certificate and an engine-driver's certificate granted under the Act.

Any person who having been engaged to serve as master of an inland steam-vessel proceeds on any voyage in that steam-vessel as master without being at the time entitled to and possessed of the certificate required under the Act, and any person who employs any person as such master without ascertaining that he is at the time entitled to, and possessed of, the certificate required under the Act, is liable to be punished with fine which may extend to five hundred rupees.

No. 27 Marine, dated Calcutta, the 31st January 1890.

NOTIFICATION—By the Govt. of Bengal, P. W. Dept.

UNDER the powers conferred upon him by section 29 of the Inland Steam-Vessels Act, 1884, and with the previous sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to make the following rules to regulate the granting of certificates of competency to masters of inland steam-vessels.

1. *Certificates of Competency* will be granted to those persons who pass the requisite examinations, and otherwise comply with the requisite conditions. For this purpose arrangements have been made for holding examinations periodically at the port of Calcutta.

2. The examinations will be held by the Port Officer and one or more other examiners to be appointed by the Government from time to time. They will commence early in the forenoon, and will be continued from day to day until all the Candidates whose names appear upon the Port Officer's list on the day of examination are examined.

3. Candidates for examination must make their application upon the appropriate form (Exn. 2b), which must be filled up at the Port Office. The Exn. 2b properly filled in, together with the candidates' testimonials and discharges, must be lodged with the Port Officer not later than the day before the day of examination.

4. Testimonials of character, and of sobriety, experience, ability, and good conduct on board ship for at least the twelve months of service immediately preceding the date of application to be examined, will be required of all applicants, and without producing them no person will be examined. As such testimonials and discharges may have to be verified before the candidate can be examined, it is desirable that they should be handed in, together with the Forms Exn. 2b, as early as possible.

5. The testimonials of servitude of Foreigners and of British seamen serving in foreign vessels which cannot be verified by the Port Officer must be confirmed either by the Consul of the country to which the ship in which the candidate served belonged, or by some other recognized official authority of that country; or by the testimony of some credible person on the spot having personal knowledge of the facts required to be established. The production, however, of such proofs will not of necessity be deemed sufficient. Each case must be decided on its own merits; and if the sufficiency of the proofs given appears to be at all doubtful, the point must be referred to the Government.

6. Should any doubt exist as to the age of a candidate, he will be required to produce a certificate of birth or baptism.

7. Foreigners must prove to the satisfaction of the Examiners that they can speak and write the English language sufficiently well to perform the duties required of them on board a British vessel. In the case of natives of India, who may not be able to speak English, their certificate shall be endorsed to the effect that they are valid only for vessels manned and officered entirely by Asiatics.

#### Colour Tests.

8. The Government have made the following arrangements for the examination of persons as to their ability to distinguish colours:—\*

9. Examinations in Colour are open to any person serving or about to serve in the Mercantile Marine.

10. Any person, including the holders of Certificates of Competency, or persons about to apply for Certificates of Competency, if desirous of being examined in Colour's only, must make application to the Port Officer on Form Exn. 2a, and pay a fee of one rupee.

11. He must on the appointed day attend for examination at the Examiner's Office; and if he passes he will receive a certificate to that effect.

12. If he fails it will be open to him to be examined again in Colours as often as he pleases on payment of the fee of one rupee at each fresh attempt.

13. The application of a Candidate who is presenting himself for Examination for a Master's Certificate must be made on Form Exn. 2b. Such examination will commence with the Colour test; and if the Candidate does not, at the time of making application, hold a Certificate of Competency of any grade, and should fail to distinguish correctly any one of the colours used in the test, he will not be allowed to proceed with the examination.

14. The fee he has paid for Examination for a Certificate of Competency will include the fee for the Colour test, and, with the exception of one rupee, will in such event be returned to him.

15. A candidate for Examination for a Certificate of Competency who, at the time of making application, does not possess a Certificate, and who fails to pass the colour test, may not be re-examined until after the lapse of three months from the date of his first failure. If he fails a second time, he will be allowed a third trial at the expiration of another three months from the date of his second failure. A fresh fee must be paid at each succeeding examination.

16. It is therefore obviously to the advantage of Candidates for Certificates of Competency to apply in the first instance to be examined in *Colours only* on Form Exn. 2a.

17. A Candidate who holds a Certificate of Competency, and who, on presenting himself for Examination for a Certificate of a higher grade, is unable to pass the Colour test, will notwithstanding be permitted to proceed with the Examination for the Certificate of the higher grade.

18. Should he pass this examination, the following statement will be written on the face of the higher Certificate which may be granted to him, viz.—“This Officer has failed to pass the Examination in Colours.”

19. Should he ultimately fail to pass the Examination, a like statement, relating to his being Colour blind, will be made by the Port Officer on his existing Certificate before it is returned to him.

20. Holders of Certificates which bear the statement of their having failed to pass in Colours, and who may desire to have the statement removed from their Certificates, must obtain the special permission of the Government.

#### *Qualifications for Certificates of Competency as First Class Masters.*

21. *Examination in Colours.*—All candidates for certificates of competency must first be examined in colours.\*

22. A candidate for a certificate as first class master of inland steam-vessels must be not less than twenty-four years of age, and must have served as a second class master in charge of a steam-vessel for not less than three years, or he must be not less than twenty-two years of age, hold a certificate of competency as second mate granted under Act I of 1859 (for the amendment of the law relating to Merchant Seamen) or the Merchant Shipping Acts 1854 to 1883, or a certificate to which the provisions of any such Act have been made applicable under the Merchant Shipping (Colonial) Act, 1869, and have served as Mate of an inland steam vessel or master of a river flat for not less than one year.

23. Each candidate will be examined apart, and *vice versa*, in each and all of the following subjects:—

- (1)—The rules of the road.
- (2)—The management of river steamers under all contingencies.
- (3)—The tide table.
- (4)—Storm signals.
- (5)—The provisions of Act VI of 1884, and the rules framed under sections 21, 29, 50 and 51 of the Act.

#### *Qualifications for Certificates of Competency as Second Class Masters.*

*Examination in Colours.*—All candidates for certificates of Competency must first be examined in colours.\*

24. A candidate for a certificate as second class Master of an inland steam-vessel must not be less than twenty-one years of age and must produce satisfactory certificates of

sobriety and intelligence, and that he has served three years as Mate of a small steam-vessel or as chief helmsman of a steam-vessel of over 80 horse power, and shall be examined *viva voce* as to his knowledge in the following subjects:—

- (1)—The rules of the road.
- (2)—The management of small river steamers.
- (3)—Storm signals.

#### Failure.

25. If a candidate fails, he will not be re-examined *until after a lapse* of three months from the date of such failure. Re-examination  
in case of failure.

26. If a candidate has failed in his examination, but the subjects in which he has failed are not included in the subjects required for a certificate of a lower grade, he may, if he desires it, receive a certificate of such lower grade. Certificate of  
lower grade.

27. No part, however, of the fee he has paid will be returned to him, and on presenting himself, when entitled so to do, for re-examination for the higher grade of certificate he will be required to pay again the full fee.

#### Fees.

28. Candidates for examination, in making their application on Form Exn. 2b, will be required to pay the examination fee before any step is taken, whether by enquiring into their services or testing their qualifications, &c. Should it be found that their service is not sufficient to entitle them to be examined, or should their testimonials be unsatisfactory, or should they from any other cause not be examined, no part of the fee will be returned to them, but when they have fulfilled the requisite service, or are able to produce satisfactory testimonials as the case may be, they will be allowed to again present themselves for examination for a certificate of the same grade without paying any further fee.

29. The fee for examination must be paid to the Port Officer. In any case in which a candidate offers money to any other officer, and in any place but in the Port Office, the candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected and not allowed to be again examined for twelve months. Fees to be paid  
by applicants for  
examination.

30. If a candidate fails in his examination, *no part of the fee will be returned to him.*

31. If the candidate satisfy the examiners as to his knowledge of the prescribed subjects, and generally as to his competency to command an inland river steamer, they shall certify the same to the Government, which will then grant a certificate to the candidate.

32. The fees are as follows:—

	Rs.	Form Exn. 15. Completion of examination.
First Class Master	... ...	16
Second Class Master	... ...	6
Renewal of a certificate	... ...	5

#### General.

33. Certificates of competency of first and second class masters shall be made and issued in the forms hereunto annexed.

34. Every certificate of competency shall be made in duplicate, and one copy shall be delivered to the person entitled to the certificate, and the other shall be kept and recorded by the Port Officer of Calcutta.

## APPENDIX A.

### INSTRUCTIONS TO EXAMINERS.

#### EXAMINATION IN COLOURS.

Herewith are—

- (a.) A lanthorn having in it a lamp in which kerosine is to be burnt.
- (b.) A side having ground glass in it.

(c.) Nine slides, each having a coloured glass in it. The colours are as follows :—

1. Red (Standard).
2. Pink or salmon.
3. Green (Standard or No. 1).
4. Green (Bottle or No. 2).
5. Green\* (Pale or No. 3).
6. Yellow.
7. Neutral.\*
8. Blue (Standard).
9. Blue\* (Pale).

(d.) Cards, five of each as follow :—

1. White.
2. Black.
3. Red.
4. Pink.\*
5. Green.
6. Drab.\*
7. Blue.
8. Yellow.

#### \* EXAMINATION BY DAYLIGHT. (CARDS.)

In conducting the examination by daylight the examiner should do it in three ways :—

1. The cards should be mixed up. The examiner should then hold up each card separately and ask the candidate to name the colour, and if the candidate does so without hesitation he is to be regarded as having passed the daylight test.
2. If the candidate hesitates in any of his answers so as to raise a doubt in the mind of the examiner as to his ability to readily distinguish colours, the examiner should put all the cards on the table and require the candidate to select all cards of a colour or colours named by the examiner.
3. Having done that they should all be mixed up again and the candidate should be required to sort the cards into eight heaps, putting all of one colour into each heap.
4. The result of the examination should be noted and recorded in each case.

The room should be dark.

The lamp lighted and placed in the lanthorn.

The applicant should be seated or should stand so as to be opposite to the opening of the lanthorn ; and, at least, 15 feet from the front of the lanthorn.

He should first of all see the light in the lanthorn without the interposition of any glass and be asked if it appears to him to have any colour, and if so what colour?

The slide with the ground glass should then be put into the opening at the front of the lanthorn which is nearest to the light, and the applicant asked the same question.

The slide with the ground glass is to be left in, and the slides with the coloured glasses placed one by one and separately in front of it, and the candidate asked in each case to name the colour or tint.

The result of the examination should of course be noted and recorded in each case.

#### GENERAL.

The cards and glasses against which a star\* is placed in the list are what may be called confusion tints. The candidate is not to be regarded as having "failed" if he miscalls these tints, provided that he names all the others correctly. But if having named all the others correctly he miscalls these so far as to name the drab card No. 6 as red, pink, salmon, &c. ; or to name card No. 7 as red, green, or yellow ; or glass No. 2 as green, blue, or yellow ; or glass No. 5 as red, pink, salmon, &c. ; or glass No. 7 as bright red or bright green ; or the plain ground glass any colour, the case should be reported for record. In short, if the candidate's perception or impression of these tints does not agree with the perception of the examiner, the case should be reported on the Form Exn. 17.

The only reasons for which a candidate is to be reported as having failed are inability to distinguish red from green, or either from black by daylight ; and red from green, or either from the ground glass, by artificial light.

If a candidate fails in the colour test when the ground glass is in the lanthorn (as it is always to be when the coloured glasses are shown) the may also be tried over again with the coloured glasses without the intervention of the ground glass, and the result noted and recorded.

By the Honourable the Lieutenant-Governor of Bengal.



Government of  
Bengal.

**Certificate of Competency**

AS

FIRST CLASS MASTER OF AN INLAND STEAM-VESSEL UNDER ACT VI OF 1884.

To

Mr.

Whereas it has been reported to the Lieutenant-Governor that you have been found, after examination, duly qualified to fulfil the duties of First-class Master of an Inland Steam-Vessel under Act VI of 1884, I do hereby grant you this CERTIFICATE OF COMPETENCY as such First-class Master.

By order of the Government of Bengal,

Given under my Hand and Seal,

Under-Secy. to the Govt. of Bengal.

This \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_

## No. of Certificate

*Address of Owner* \_\_\_\_\_  
*Date and Place of Birth* \_\_\_\_\_  
*Signature* \_\_\_\_\_

*Any master who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500.*

*N.B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Government of Bengal.*

*Issued at Calcutta on the* \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_.  
*Registered,*

*Port Officer of Calcutta.*

By the Honourable the Lieutenant-Governor of Bengal.



Government of  
Bengal.

**Certificate of Competency**

*As*

SECOND CLASS MASTER OF AN INLAND STEAM-VESSEL UNDER ACT VI OF 1884.

Mr.

Whereas it has been reported to the Lieutenant-Governor that you have been found, after examination, duly qualified to fulfil the duties of Second-class Master of an Inland Steam-Vessel under Act VI of 1884, I do hereby grant you this CERTIFICATE OF COMPETENCY as such Second-class Master.

By order of the Government of Bengal,

Given under my Hand and Seal,

Under-Secy. to the Govt. of Bengal.

18—.

This day of

## No. of Certificate

Bearer \_\_\_\_\_ son of \_\_\_\_\_ by caste \_\_\_\_\_

Date\* and Place of Birth, showing Village, Thana and District \_\_\_\_\_

Residence, showing Village, Thana and District \_\_\_\_\_

Height \_\_\_\_\_

Personal description, stating particularly any permanent marks or scars \_\_\_\_\_

No. of Register Ticket \_\_\_\_\_

Signature \_\_\_\_\_

Any master who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500.

N.B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Government of Bengal.

Issued at Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
Registered,

Port Officer of Calcutta.

\* If not known exactly must be stated on the best information or evidence.

## REGULATIONS

RELATING TO THE

EXAMINATION OF ENGINEERS AND ENGINE-  
DRIVERS OF INLAND STEAM-VESSELS.

## Preliminary.

UNDER the provisions of the Inland Steam-Vessels Act, an inland steam-vessel having engines of eighty nominal horse-power or upwards cannot proceed on any voyage unless her engineer possesses an engineer's certificate granted under the Act or the Indian Steam Ships Act, 1884, or the Merchant Shipping Acts, 1854 to 1883, or to which the provisions of any such Act have been made applicable under the Merchant Shipping (Colonial) Act, 1869; and no such ship having engines of under eighty nominal horse-power can proceed on any voyage unless she has as her engineer a person possessing an engine-driver's certificate granted under the Act or the Indian Steam-Ships Act, 1884, or a certificate of the higher grade of the nature referred to above: Provided that a steam-vessel having engines of under eighty nominal horse-power shall be deemed to have complied with the law if she has as her master and engineer a person possessing both a second class master's certificate and an engine-driver's certificate granted under the Act.

Any person who has been engaged to serve as Engineer or engine-driver of an inland steam-vessel proceeds on any voyage in that steam-vessel as engineer or engine-driver, as the case may be, without being at the time entitled to, and possessed of, the certificate required under the Act, and any person who employs any person as engineer or engine-driver without ascertaining that he is at the time entitled to, and possessed of, the certificate required under the Act, is liable to be punished with fine which may extend to five hundred rupees.

No. 28 Marine, dated Calcutta, the 31st of January 1890.

NOTIFICATION—By the Govt. of Bengal, P. W. Dept.

UNDER the powers conferred upon him by section 29 of the Inland Steam-Vessels Act, 1884, and with the previous sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to make the following rules to regulate the granting of certificates of competency to engineers and engine-drivers of inland steam-vessels.

1. Certificates of competency will be granted to those persons who pass the requisite examinations and otherwise comply with the requisite conditions. For this purpose examiners have been appointed and arrangements have been made for holding the examinations periodically at the port of Calcutta.

2. The examinations will commence early in the forenoon and will be continued from day to day until all the candidates whose names appear upon the Port Officer's list on the day of examination are examined.

3. Candidates for examination must make their application upon Form Exn. 3, which must be filled up at the Port Office. The Exn. 3 properly filled in, together with the candidate's testimonials, must be lodged with the Port Officer not later than the day before the day of examination.

4. Testimonials of character, and of sobriety, experience, ability, and good conduct for at least the 12 months immediately preceding the date of application to be examined, will be required of all applicants, and without producing them no person will be examined. If the service has been on shore, the testimonial must be signed by an employer; if at sea, by either the master, managing owner, chief or superintending engineer.

5. As such testimonials and discharges may have to be verified before the candidates can be examined, it is

desirable that they should be handed in, together with the Form Exn. 3, as early as possible.

**Testimonials  
of Foreigners.**

6. The testimonials of servitude of Foreigners and of British Seamen serving in foreign vessels which cannot be verified by the Port Officer must be confirmed either by the Consul of the country to which the ship in which the candidate served belonged, or by some other recognized official authority of that country; or by the testimony of some credible person on the spot having personal knowledge of the facts required to be established. The production, however, of such proofs will not of necessity be deemed sufficient. Each case must be decided on its own merits; and if the sufficiency of the proofs given appears to be at all doubtful, the point must be referred to the Government.

**Certificate as  
to age.**

7. Should any doubt exist as to the age of a candidate, he will be required to produce a certificate of birth or baptism.

**Foreigners to  
know English.**

8. Foreigners must prove to the satisfaction of the Examiners that they can speak and write the English language sufficiently well to perform the duties required of them on board a British vessel.

**Verification of  
services, &c.,  
by Articles.**

9. Services which cannot be verified by proper entries in the articles of the ships in which the candidates have served cannot be counted.

### Qualifications for Certificates of Competency as Engineers.

**Qualification of  
candidate for  
Inland Engi-  
neer's Certificate.**

10. A candidate must be not less than twenty-two years of age:—

(a) He must have served an apprenticeship to an engineer, of three years in England or five years in India, and must prove that during the period of his apprenticeship he has been employed on the making and repairing of engines. Or, if he has not served an apprenticeship, he must prove that for not less than three years in England or five years in India he has been employed as a journeyman or master-hand in some factory or workshop on the making or repairing of engines. In either case he must also have served two years thereafter in the engine room of a steamer of over 80 horse power, or as a certificated engine-driver in a steamer of less than 80 horse power.

Or failing the above service he must have served as a certificated engine-driver in charge of a steamer for not less than four years.

(b) He must be able to give a description of boilers, and the methods of staving them, together with the use and management of the different valves, cocks, pipes, and connections.

(c) He must understand how to correct defects from accident, decay, or other causes and the means of repairing such defects.

(d) He must understand the use of the barometer, thermometer, and salinometer, and the principles on which they are constructed.

(e) He must state the causes, effects, and usual remedies for incrustation and corrosion.

(f) He must be able to state how a temporary or permanent repair could be effected in case of derangement of a part of the machinery, or total breakdown.

(g) He must write a legible hand, and understand the first five rules of arithmetic, and decimals, and their application to questions about consumption of stores, and full capacities of tanks and bunkers, the duty of pumps, and the direct strains in engines and boilers.

(h) He must be able to pass a creditable examination as to the various constructions of paddle and screw engines in general use; as to the details of the different working parts, external and internal, and the use of each part.

**Qualifications for Certificates of Competency as  
Engine-drivers.**

11. Candidates for examination must make their application upon the appropriate Form (Exn. 3b), which must be filled up at the Port Office.

12. A candidate for a certificate of competency as engine-driver must have attained the age of twenty-two years.

He must have served an apprenticeship of at least four years if in India or three years in the United Kingdom, and have served as assistant engineer for one year on a steamer of not less than 80 horse power.

Or he must have been three years principal serang or tindal in the engine-room of a steamer, or have been for three years in charge of the engine of a factory or mill under a European manager or engineer, as well as one year principal serang or tindal or assistant engineer in the engine-room of a steamer under a certificated engineer.

13. He must have the testimonial shown in Appendix B filled up by the engineer with whom he has last served, or his other testimonials must contain all the particulars therein required.

14. He must pass a *viva voce* examination before the Board of Examiners as to the working of an engine and the use of its different parts.

15. He must be able, if required, to show his practical qualifications by one week's trial in a steamer after fulfilling the other tests to which he will be subjected.

**General Rules as to Examinations.**

16. All books necessary for the use of candidates under examination will be provided by the Government, and applicants will not be permitted to take into the examination room any book, paper, document, or memoranda of any description whatever; and, subject to the provisions referred to hereafter, they will also not be allowed to work out their problems on a slate or on waste paper.

Candidates not  
to take books,  
&c., into exam-  
ination room.

17. Candidates will be allowed in the time allotted to cancel any part of their work, and when required additional papers will be supplied by the Examiners. These additional sheets must be attached to, and form part of, the examination papers.

18. In the event of any candidate being discovered copying from another, or affording any assistance or giving any information to another, or communicating in any way with another during the time of examination, he will be regarded as having failed in his examination, and will be turned back for three months, in the same manner as if he had failed in the practical part of the examination; and no part of the fees he may have paid for examination will be returned to him.

Punishment  
for breaking  
rules.

19. If a candidate leaves the room before answering any question which has been given to him, he cannot afterwards be permitted to answer it, but the examiners may substitute other data or another question.

Leaving exam-  
ination room.

20. All applicants presenting themselves for examination for certificates of competency as engineers will be required to give written answers to eight out of a list of ten questions selected from Form Exn. 15a, "Elementary Questions for the first examinations of Engineers for certificates of competency." These questions are intended to furnish a record to some extent of the candidate's knowledge at the time of his examination, and also to induce the candidates to pay more attention to their handwriting and spelling.

Questions from  
Form Exn. 15a.

21. The Form Exn. 15b., on which these answers will be written, contains also some questions as to the experience of the applicant, to be answered by him in writing.

22. Examiners may add to their *viva voce* questions on the practical management of steam engines and boilers any of those contained in Exn. 15a.

23. If at the expiration of the time allowed the candidate has worked out correctly the whole of the questions set to him, and given satisfactory answers in the *vivâ voce* examination, he will be declared to have passed.

24. If at the expiration of the time allowed he has not worked out the whole of the questions set to him, but if the result of the *vivâ voce* examination taken in connection with the answers to such of the questions as he has worked out is sufficient to satisfy the Examiner that the applicant is competent to take charge of engines, he will be declared to have passed.

(Exn. 15.) 25. In other cases he will be declared to have failed.  
 26. A report of the examination, and the examination papers, will be forwarded to the Government on the Form (Exn. 15).

Notification of having passed will be given to successful candidates.  
 (Exn. 16.)

27. If the candidate passes, he will receive the Form Exn. 16, upon which the Government will issue the certificate to the candidate, whose testimonials, &c., will be returned at the same time. It is therefore important that the port of destination of the certificate should be the same on both the Form Exn. 16 and the Form Exn. 2. If circumstances should make any alteration necessary, the examiners should see that it is made in both forms, otherwise delay in the issue of the certificate may be caused.

#### Fees.

Fees to be paid by applicants for examination.

28. Candidates for examination, in making their application on Form Exn. 3 or Exn. 3b, will be required to pay the examination fees before any step is taken, whether by inquiring into their services or testing their qualifications, &c. No part of the fee will under any circumstances be returned to them, but should it be found that their service is not sufficient to entitle them to be examined, or that their testimonials are unsatisfactory, they will be allowed to present themselves for examination without paying any further fee, when they have fulfilled the requisite service, or are able to produce satisfactory testimonials, as the case may be.

29. The fee for examination must be paid to the Port Officer. In any case in which a candidate offers money to any other officer, and in any place but in the Port Office, the candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be examined for twelve months.

30. If a candidate fails in his examinations, *no part of the fee he has paid will be returned to him.*

31. The fees are as follow :—

	Rs.
Engineers ... ... ...	12
Engine-drivers ... ... ...	10
Renewal of a certificate ... ...	5

#### Failure.

32. If the applicant fails in the *vivâ voce* or practical part of the examination, he may not present himself for re-examination until he can produce proofs of THREE MONTHS' further service afloat. If he fails in arithmetic or drawing only, he may come up again at any time. Engine-drivers may be examined *de novo* after six months, if the past examination showed that they might reasonably be expected to qualify.

#### General.

33. Certificates of competency of engineers and engine-driver shall be made out and issued in the forms hereunto annexed.

34. Every certificate of competency shall be made in duplicate, and one copy shall be delivered to the person entitled to the certificate, and the other shall be kept and recorded by the Port Officer of Calcutta.

## APPENDIX A.

## Form Exn. 15a.

## ELEMENTARY QUESTIONS FOR THE FIRST EXAMINATIONS OF ENGINEERS FOR CERTIFICATES OF COMPETENCY.

## To ENGINEER EXAMINERS.

Examiners will require all candidates to fill up a form, Exn. 15b., of which a copy is enclosed, and they will forward the same to the Government along with the report of the examination.

The arithmetical questions for Engineers and the *viva voce* examinations for all candidates will be continued as heretofore, and failure in the elementary questions will be treated as failure in arithmetic.

The numbers of the questions for each examination will be selected by the examiners, and they are not to be communicated to the candidate until his examination commences.

## Exn. 15b.

Port	Class for which examined
Date	Candidate's name

A. Where and how long did you serve in works at the making or at the repairing of Engines, and in what capacities ?

B. How long have you served as fireman or trimmer ?

C. How long have you served in the Engine-room at sea, and in what capacities ?

D. With what descriptions of Engines have you served at sea— Paddle or Screw or both, Jet Condensing, Surface Condensing, or Non-condensing Engines, Compounds, Trunks, Inverted Cylinders, or Horizontal Engines? What size were the Engines?

E. With what descriptions of Boilers have you served at sea— Rectangular or Cylindrical, Wet-bottomed or Dry-bottomed, Multitubular, Sectional or Flue Boilers?

F. What Engine defects have come under your notice at sea,  
what caused these defects, and how were they remedied ?  
Give the names of the Steamers for verification.

G. What Boiler defects have come under your notice at sea,  
what caused these defects, and how were they remedied ?  
Give the names of the Steamers for verification.

For the questions to be answered on the following pages, See  
the book of Elementary Questions. The questions need not be  
written: only the answers to them.

Question No.

## ELEMENTARY QUESTIONS.

1.

What parts of an engine are generally made of wrought-iron?

2.

What parts of an engine are generally made of cast-iron?

3.

For what parts of an engine is steel sometimes used?

4.

What parts of an engine are generally made of brass or gun-metal?

5.

Where is "white metal" sometimes used? On account of what property possessed by it is it adopted? What objection is there to its more general use?

6.

For what parts is Muntz metal sometimes used? Is it malleable? For what properties is it valued?

7.

What difference is there in the composition of cast-iron, of wrought-iron, and of steel?

8.

How can cast-iron, wrought-iron, and steel be distinguished from each other?

9.

What are the different properties of cast-iron, of wrought-iron, and of steel?

10.

What is meant by the terms "breaking stress," "proof stress," "safe-working stress"?

11.

What is the cohesive strength or breaking stress of good ordinary wrought-iron?

12.

Tempering steel: how is it done, and in what order do the colours come?

13.

What is case-hardening?

14.

Which of the common metals or alloys can be forged, and which of them are brittle or "short"?

15.

What is meant by "welding"? Which of the common metals can be welded?

16.

The expansion of metals by heat: give examples of this in the engine and in the boiler.

17.

In the construction of cylindrical marine boilers, for what parts have the plates to be worked hot? When the material is steel, what precautionary treatment of these plates is afterwards necessary?

18.

What is double riveting? In what parts of cylindrical marine boilers is double riveting employed? In which of the shell seams is it most necessary?

19.

What is "caulking," and how are seams prepared for caulking?

20.

Describe the different ways of fastening the ends of the main stays of a boiler. What are the merits of, or objections to, the different plans ?

21.

What strain per square inch is allowed on boiler stays ?

22.

Describe a riveted stay, and state where such stays are commonly used.

23.

Where are thin plates to be looked for in a boiler as it wears, and how is the thinness to be detected ?

24.

How are boiler tubes fixed ? What are "stay tubes," and how are they secured ?

25.

Where is it generally that boiler tubes leak ? How is this defect repaired ? What are the causes of this leaking ?

26.

What are the causes of cracked tube plates ? Where are the cracks situated ? How are they repaired ?

27.

What is the difference between a "dry uptake" and a "wet uptake" ? Which requires most repair ? Why ? Where have you seen a wet uptake ?

28.

What is a superheater ? What is its construction ? What valves are on it ? There is sometimes a gauge glass on it ; what is that for ?

29.

What parts of a marine tubular boiler are first injured by shortness of water ?

30.

Where are angle irons sometimes used in the construction of a boiler, and where are flanged plates used ?

31.

Priming : to what causes is it attributed ? What means are applied to prevent it ? What evils may be produced by it ?

32.

Funnel draught : what makes it ? What checks it ?

33.

Flame is sometimes seen at the top of the funnel : what causes this appearance ? Is it beneficial or is it detrimental ? Why so ?

34.

A blast pipe : what is its construction ? Where is it placed ? For what is it used ?

35.

How many bottom blow-off cocks are generally fitted to each boiler, and why are they so fitted ?

36.

Blow-off cocks are sometimes fitted with a spanner guard : for what purpose is this ? Describe how the guard is formed ?

37.

Test cocks or water-gauge cocks : where are they placed ? At what heights ? Must the cocks themselves be at those heights ? What provision is made for cleaning these cocks ? Should they ever become choked ? When there are no test cocks, how is the height of the water ascertained ?

38.

What is a dead-weight safety valve? Of what are the rubbing surfaces formed? How is a lock-up valve arranged to admit of lifting it or of turning it round, and to prevent adding to the weight?

39.

About what area of safety valve is now required by the Board of Trade? What area was formerly required, and on what ground has that been altered? What is the effect of suddenly opening a safety valve when steam is up? To about what extent do safety valves rise when blowing off without being eased by hand?

40.

Spring-loaded safety valves: what advantages have they that are not possessed by dead-weight valves? What are the disadvantages as compared with dead-weight valves?

41.

Of what pieces does a glass water gauge mounting consist? How does it act? Where is it placed? At what height? Is it liable to derangement? How is its working tested?

42.

Glass water gauges have sometimes pipe connections top and bottom: what is the object of this arrangement? Should there be cocks at the extremities of these pipes?

43.

Describe a Bourdon's steam gauge. Some gauges have an inverted siphon pipe below them: what is its use?

44.

Why is a small cock sometimes put on the pipe leading to a steam gauge? Where should it be placed, and what error might be made by omitting to use it?

45.

Do steam gauges indicate the total pressure of the steam, or only a portion of that pressure? What is the pressure measured from?

46.

What is meant by the salting of the boiler? How is this prevented? What is the density of ordinary sea water? How is the density ascertained? What is the difference between the formation of scale and the salting of the boiler? What is the maximum density at which boilers should be worked at sea?

47.

Scum cocks and pipes: how are they arranged? Where are they placed? At what height in the boiler? When are they used? When must they be shut? Neglect of these cocks lead to what dangers?

48.

Scale: of what does it consist? Where is it most objectionable? How is it removed? How is its formation prevented? What evil effects are produced by it?

49.

What is a salinometer? Of what does it consist? How does it act? How is it graduated? Can it be used at any temperature indiscriminately?

50.

What harm may be done through the check valve of one of a set of boilers being defective while under way? How would you work to avoid this harm?

51.

How is the leak from a split tube stopped in a boiler at sea? Describe the operation.

52.

What is the use of dampers? Where are they fitted? When should they be used?

53.

When there are no dampers fitted, what is used instead? What evil to the boiler is sometimes attributed to this? When the heating surfaces are clean does this occur?

54.

Describe the piston of a steam cylinder, with its different rings and their uses. There are generally round pieces let in flush on one side of a piston: what are they? How are these pieces fixed?

55.

Cylinder drain cocks: what is their use? There is sometimes a valve upon each cock: what purpose does it serve?

56.

Cylinder escape valves: of what do they consist? How protected? How regulated? When are they most needed? To what danger do they expose the Engineer? What precaution is sometimes used to obviate this danger?

57.

What is a compound engine? What different kinds are there for screw steamers, in respect to the number and arrangement of their cranks and cylinders? What is a triple expansion engine?

58.

What is link motion? What are some of its advantages? In modern engines for the screw propeller when there is no link motion, what takes its place?

59.

What is a separate expansion valve? Why is it not fitted to all engines? What effect has an expansion valve upon the starting and upon the reversing of the engine?

60.

What arrangement is applied to reduce the friction of a slide valve? To what is the friction due?

61.

Describe a loose eccentric; how does it act? In what engines is the loose eccentric still employed?

62.

What is the travel of the eccentric rod? How is it measured on the eccentric? What is the travel of the slide valve when the link motion is in mid gear and the engine still moving?

63.

What are "double beat valves"? Why are they not generally used for safety valves? Are they ever used instead of the slide valve? What objections are there to their use?

64.

What is a circulating pump? Is it always worked by the main engine? Give an example from your last steamer of the three water temperatures generally noted by careful engineers.

65.

An air valve is sometimes fitted to a circulating reciprocating pump: what purpose does it serve?

66.

What is the difference between a bucket air-pump, a piston air-pump, and a plunger air-pump?

67.

Whether are double-acting air-pumps made with plungers, with pistons, or with buckets?

68.

What is an air-pump trunk? When is it necessary? How is it attached to the bucket?

69.

What class of air-pump requires both foot and delivery valves, and in what other class can either of these valves be in some cases dispensed with?

70.

When under way, when the air-pump bucket is at the top of its stroke, at what height is the water in the condenser?

71.

With a surface condenser and a single acting air-pump, what is the effect of a leaky foot valve, and what is the effect of a leaky bucket when there is also a foot valve?

72.

Air-pump pet cock or valve: where is it placed? How does it act? What is its object? Does it in every case reduce the effective capacity of the pump? Is it equally applicable to double acting pumps?

73.

At what temperature is the hot well worked? What is the effect of higher temperatures? What is the effect of lower temperatures? What limits the lowness of temperature? Has a very low temperature any disadvantages?

74.

Bilge injection with common condensers: what are the fittings required? When is it used? What precautions are necessary in using it?

75.

When surface condensers are used, what takes the place of the bilge injection? To what is the connection made? How is its valve formed? Why is this necessary?

76.

What are the practical guides to the proper amount of opening of the inlet valve for the circulating pump?

77.

Feed-pump pet cock or valve: where is it placed? What is its use? How does it act? Is it always a necessary fitting?

78.

What are some of the ways of fastening the ends of surface-condenser tubes? About what size and about what thickness are condenser tubes? What parts of a surface condenser are made of brass?

79.

What is a blow-through valve or cock? To what is it attached? There is sometimes a valve that when opened admits steam from the slide valve casing to the exhaust port: what is its use? To which cylinder is it fitted?

80.

What is a shifting valve? What is its use? Where is it placed? Can it be placed too high? Can it be placed too low? At what height should it be placed? Was there one in your last steamer; if so, where was it? Why are shifting valves generally omitted now?

81.

What connections are generally fitted to the donkey-pump, and to what services can it be applied?

82.

When the engines are stopped with steam up, what are to be shut and what are to be opened?

83.

How is an engine heated up before starting? What precautionary examinations are made before starting?

84.

What is an interceptor or catch-water? Where is it fixed; what is its construction; how does it act; and what attention does it require?

85.

Describe an air-pump bucket, with its valve or valves and its packing. Of what are the valves generally made?

86.

Of what materials are air-pump rods made? Why so?

87.

What is the racing of the engine? When does it occur? What danger attaches to it? What is done to prevent it?

88.

What are marine governors? What is their general construction? How do they act?

89.

What is meant by the "pitch" of a screw propeller? How is it measured?

90.

Explain the difference between a "right hand" and a "left hand" propeller, and state how each of them revolves.

91.

What is the slip of a screw propeller? How is its amount expressed in figures?

92.

Which of the valves about engines and boilers have to be worked by hand, which of them work self-actingly, and which are worked by the motion of the engine?

93.

Why is soda sometimes put into a boiler, and how is it put in which under way? What is the kind of soda used?

94.

Tallow cups for cylinders were sometimes made with two small cocks, or with only one small cock, or with one large hollow plug cock, or with one small cock and a valve; which of these is suitable for a high-pressure cylinder, and which for the cylinder of a condensing engine? Describe how the cup with only one small cock is used. What is now generally used instead of these? How has this change come about?

95.

Does a cylinder escape valve, self-acting, allow all the water to escape; if not, how much is left in the cylinder?

96.

What is a "Steam Lubricator" (sometimes called an Impermeator)? Explain its action; to what part of the engine is it connected; whether will throwing cold water over it make it work faster or slower? Describe the one used in your last steamer?

97.

A common paddle wheel: of what is the centre made? Of what are the arms formed? What is the form of the bolts which attach the floats to the arms? How are the arms attached to the centres?

98.

Why have some paddle wheels one or more cast-iron floats in each wheel? With what engines are these most required? At what part of the circumference are they placed?

99.

Why are paddle wheel floats sometimes made of different breadths in the same wheel? With what description of engine is this most needed? Where are the broad floats placed, and where are the narrow floats placed in the circumference of the wheel?

100.

What difference is there between a radial paddle wheel and one with feathering floats? What is the object of feathering floats? Are all the eccentric rods attached in the same way, and are they all of the same form?

101.

Whereabout is the centre of the eccentric of a paddle wheel with feathering floats placed? In that case are the feathering levers on the striking face or on the back of the float? When the paddle shaft has an outer bearing, how is the eccentric made?

102.

Of what materials are the working surfaces of a paddle wheel with feathering floats? Are they all lubricated? With what?

103.

What is a "Disconnecting Paddle Engine"? At what place is the disconnecting effected? How is it accomplished? In which of the cranks of a disconnecting engine are the crank pins fixed?

104.

Whether is link motion valve gear or the loose eccentric generally used for disconnecting paddle engines? For what steamers are disconnecting paddle engines frequently employed?

105.

What are expansion joints? Where are they necessary? What attention do they require? Of what should the working surfaces be made?

106.

What omission in the construction of expansion joints may lead to a serious accident when steam is first applied? How is this prevented in the construction of a steam trunion pipe for an oscillating engine?

107.

Describe an oil cup with a syphon worsted. How is the worsted arranged? How is it cleaned? How far down the tube does it extend?

108.

Describe a thrust bearing; which of the surfaces wears? Why are there sometimes a number of oil tubes for one thrust bearing?

109.

What parts of a screw shaft are generally covered with brass? Why is this necessary? About what thickness is the brass?

110.

What is the stern tube or screw shaft pipe? Why is a pipe of such a length required? Of what is it made? How is it fixed at each end?

111.

What is a lignum vitae bearing? How is the wood fitted? Where is such a bearing generally used?

112.

How is a screw propeller fixed on the shaft? What means are used to prevent its getting loose at sea?

113.

Where are sluice valves placed? What large sluice valve is there in almost all screw steamers? From what position should this valve be worked? Why so? What attention should it receive?

114.

With a condensing engine; what valves or cocks are on the skin of the ship in the engine-room and in the stokehole?

115.

What are the necessary fittings of a marine boiler?

116.

With a surface condensing engine what cocks or valves are open some time before the engine is started so as to be ready for starting whenever the order is given?

117.

What is a steam jacket? What cocks are on it? In what engines are jackets most generally used? Do they require to be felted?

118.

What parts of an engine or its fittings should be felted or otherwise protected from radiation?

119.

What are the small cylinders sometimes fitted on the slide valve casing cover of vertical engines? Explain their action. To what are they connected by a pipe? Why so?

120.

Name the principal pipes in connection with the engines and boilers of a steamer, and state to what the ends of these pipes are connected.

121.

Through what cocks or valves, pipes and chambers does the water pass on its way from the sea inlet rose plate to the water space of the boiler, with a jet condenser?

122.

Through what cocks or valves, pipes and chambers does the circulating water of a surface condenser pass?

123.

Through what cocks or valves, pipes and chambers does the steam pass from the boiler until it is in the form of water in the hot well?

124.

Name the pieces of the engine through which the pressure of the steam is transmitted from the piston to the screw propeller. Name them in the order in which they act.

125.

What is an air vessel? How does it act? At what parts of an engine or of its fittings are air vessels generally applied?

126.

What is the construction of a mud box? Where should mud boxes be placed? Why are they necessary? How should the space be divided by the rose plate, and why?

127.

What is a trunk engine? When used in a horizontal engine for a right-hand screw propeller at which side of the vessel should the cylinders be placed? Why so?

128.

What is an oscillating engine? For what steamers are oscillating engines generally adopted? Why? How is the steam conveyed to and from the slide valve casing?

129.

Of what parts does the valve motion gear of an oscillating engine consist?

130.

For what have geared engines sometimes been used? Of what were the cogs of the large wheel made?

131.

At what part of a screw steamer is the pressure that propels it applied to the hull?

132.

At what part of a paddle steamer is the pressure that propels it applied to the hull?

133.

About how much fuel per indicated horse power per hour is required by modern steam engines, common, compound and triple expansion?

134.

What is the explanation of the economy of the surface condenser?

135.

What is the construction of a surface condenser? Of what are its tubes made? How are they fixed? How are they kept tight? What is done with a split tube?

136.

Where do surface condensers foul? How are they cleaned?

137.

What non-conducting substances are employed to prevent radiation, and how are they applied?

138.

In the construction of smoke-box doors and of dry uptakes, what provision is made to lessen the amount of radiation?

139.

How can the formation of black smoke be prevented? Describe smoke preventing apparatus.

140.

What is meant by "circulation" in a boiler, and what are the results of defective circulation?

141.

What means are sometimes adopted to improve the circulation in a boiler?

142.

By what arrangement is the circulation promoted in a "hay-stack" boiler?

143.

Describe a ship's side air-pump discharge valve, in what respects does it sometimes differ from a common stop valve, and what attention does it require?

144.

What is the construction of a feed escape valve, to what is its discharge connected, and how is its loading regulated?

145.

When there is no feed escape valve, what is the arrangement of the feed valves or cocks?

146.

What is the measure of a horse-power? How is indicated horse power ascertained?

147.

Has "nominal horse power" a fixed meaning? What is the use of this expression? What is generally taken as the measure of one horse power nominal?

148.

What is "back pressure" in a cylinder? About how much is it in each of the cylinders in your last steamer? Is excessive cushioning ever a trouble under certain conditions in modern engines? Say when and why and in which cylinder this occurs.

149.

What is meant by "speed of piston"? About how much is the speed of piston in modern marine engines?

150.

What is "atmospheric pressure"? What is its average amount? What instrument tells this amount?

151.

What is "gross pressure" or "absolute pressure"? What pressure is it that is shown by the steam gauge?

152.

What is meant by "cutting off" steam? How is it done? What part of the valve regulates the cut off?

153.

What is a piston slide valve? Describe its construction. Why are such frequently employed in place of the common slide valve? What is a great drawback to the use of these valves?

154.

What fixes the time of closing the exhaust? After the exhaust is closed and before the port opens for steam, what becomes of the steam that is in the cylinder?

155.

What is the "lead" of the valve? What is its object? About what amount is it?

156.

What is the "cover" or "lap" of the valve? What is its object? About what proportion of the stroke of the valve is it made?

157.

What is the "exhaust cover" of a slide valve? What is its effect upon cushioning and upon exhaust?

158.

What is "minus cover" or "minus lap" on the exhaust? What is its effect upon the exhaust and upon cushioning?

159.

What is "cushioning" or "compression" in a steam cylinder? How is it affected by the amount of cover or of minus cover there may be upon the exhaust? How is it affected by the exhaust pressure?

160.

What is "mean effective pressure"? How is its amount ascertained?

161.

What is a dial vacuum gauge? What is its construction? For what is it used? About what amount should it show when the engine is working all right? What effect has the variations it indicates on the performance of the engine?

162.

Does the vacuum gauge enable you to tell what pressure there is in the condenser, or must you have recourse also to the barometer to arrive at that? How would you ascertain the actual amount of back pressure there is in the condenser?

163.

What is a barometer? What is its construction? Is a barometer sometimes used instead of a vacuum gauge? In what respect does the weather barometer differ from the vacuum gauge barometer?

164.

The common vacuum gauge and the common steam gauge, in which of them are the graduations marked from atmospheric pressure? Does either of them tell what is the true actual pressure in the boiler or in the condenser?

165.

Do steam and vacuum gauges vary with the variations of the weather barometer? When the weather barometer varies from 29 to 31, how much will the vacuum gauge vary, and how will that affect the working of the engine? Why so?

166.

Vacuum is generally stated as so many inches. What is meant by, say, 20 inches vacuum? What does that tell us about the absolute pressure of the vapour then in the condenser?

167.

From what depth will a pump draw water? Is there any limit? Why?

168.

What is vacuum? Can vacuum move a piston? When the temperature of the water in the condenser is 212°, what is the greatest degree of vacuum there can then be in the condenser?

169.

What is a thermometer, its construction? What is the property of matter that is the principle of its construction? What temperatures are regularly noted by careful engineers?

170.

What is the temperature of (1) melting ice, (2) of boiling water, (3) of steam about 60 lbs. pressure by the steam gauge, (4) of steam about 100 lbs, and (5) of strain about 150 lbs, also (6) of smoke in the funnel, and (7) of water in the hot well?

171.

What is meant by the "conduction" of heat? Give examples of it in the boiler and in the engine.

172.

What is meant by the "convection" of heat? Give examples of it in the boiler and in the engine.

173.

What is meant by "radiation" of heat? Give examples of it in the boiler and in the engine.

174.

Which is convection, which is radiation, and which is conduction in the following cases. (1) Heat from the glowing fuel to the furnace crown. (2) Heat passing from one side of the furnace crown plate to the other. (3) Heat passing from the steam pipes in the engine-room. (4) The heat of evaporation?

175.

What are the effective heating surfaces of a marine boiler? What is an objection to vertical heating surfaces?

176.

What parts of a marine engine are exposed to danger when the temperature is below freezing point?

177.

What precautions are necessary in cold climates when the temperature is below freezing point?

178.

State as many ways as you can by which a boiler might not get its full feed; that is, a boiler, or one of a set of boilers, get short of water, although the feed valve is open its proper amount; to what causes might this be due?

179.

Of what are furnace bars generally made? About what thickness are they at top? About what space is between them? Whether are the bars put further apart for Newcastle coal or for Welsh coal?

180.

Which burns faster, Newcastle coal or Welsh coal? Which is the flaming coal? Which makes most smoke?

181.

About how many tons of steam coal will be burnt per day in our furnaces, each 3' 0" wide, and of about the usual length? On what grounds do you say so?

182.

About how many tons of steam coal will be burnt per day with good compound engines to drive an ordinary steamer of 40 ft. beam 10 knots an hour by steam alone? On what grounds do you say so? What percentage more coal would be required to propel the same steamer one knot faster?

183.

About how many tons of steam coal will be burnt per day with a good compound engine, surface condensers, the low pressure cylinder 70 inches diameter, doing average work? On what grounds do you say so?

184.

A pair of inverted cylinder direct acting engines, there is a liner half an inch thick between the ahead eccentric rod and the eccentric strap, in overhauling the engine this piece is lost and forgotten; what difference will its omission make in the working of the engine, on the admission, on the cut off, and on the exhaust of the steam? Which will take place earlier, and which later, distinguishing between the up stroke and the down stroke?

185.

A pair of inverted cylinder direct acting engines driving a right-hand screw; on which of the crosshead guide bars is the pressure greatest in the up stroke, and on which in the down stroke?

186.

A screw propeller is getting loose, it has a little play on the shaft, sideways on the key or feather; how will this show in the engine-room?

187.

How would you prove whether the centre line of the trunions of an oscillating cylinder be fair with the centre line of the main shaft?

188.

How can the fairness of a line of screw shafting be tested without lifting the shafts?

APPENDIX B.

TESTIMONIAL.

I hereby certify that has served with me in the engine-room of as principal serang or tindal for a period of , during which time he has discharged his duties to my entire satisfaction.

I consider that he fully understands the working of an engine, and has sufficient tact, presence of mind, and energy to look after and manage the working of the engines of a river steamer having engines not exceeding 80 nominal horse-power.

Date (Signed.)

No. and description of Certificate.

---

ANY Engineer giving a testimonial in this form should be very careful in doing so, as the document may materially influence the applicant's eligibility as a candidate.

By the Honourable the Lieutenant-Governor of Bengal.



Government of  
Bengal.

Certificate of Competency

as

ENGINEER OF AN INLAND STEAM-VESSEL UNDER ACT VI OF 1884.

To

Whereas it has been reported to the Lieutenant-Governor of Bengal that you have been found duly qualified to fulfil the duties of Engineer of an Inland Steam-Vessel, I do hereby, in pursuance of Act VI of 1884, grant you this CERTIFICATE OF COMPETENCY.

By order of the Government of Bengal,

Given under my Hand and Seal,

Under-Secy. to the Govt. of Bengal.

This \_\_\_\_\_ 18\_\_\_\_\_.

## No. of Certificate of Competency

Bearer \_\_\_\_\_

Date and Place of Birth \_\_\_\_\_

No. of Register Ticket \_\_\_\_\_

Signature \_\_\_\_\_

*Any ENGINEER who fails to deliver up a Certificate which has been cancelled or suspended, is liable to a penalty not exceeding Rs. 500.*

*N.B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Government of Bengal.*

Issued at Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_

Registered,

Port Officer of Calcutta.



Government of  
Bengal.

**Certificate of Competency**

A.S

**ENGINE-DRIVER OF AN INLAND STEAM-VESSEL UNDER ACT VI OF 1884.**

**TO**

Whereas it has been reported to the Lieutenant-Governor of Bengal that you have been found duly qualified to fulfil the duties of Engine-Driver on an Inland Steam-Vessel having engines of under 80 nominal horse-power, I do hereby, in pursuance of Act VI of 1884, grant you this CERTIFICATE OF COMPETENCY as Engine-Driver.

By order of the Government of Bengal,

Given under my Hand and Seal

This \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_. Under-Secy. to the Govt. of Bengal.

## No. of Certificate

Bearer \_\_\_\_\_ son of \_\_\_\_\_ by caste \_\_\_\_\_

Date\* and Place of Birth showing Village, Thana and District \_\_\_\_\_

Residence showing Village, Thana and District \_\_\_\_\_

Height \_\_\_\_\_

Personal description, stating particularly any permanent marks or scars \_\_\_\_\_

No. of Register Ticket \_\_\_\_\_

Signature \_\_\_\_\_

I issued at Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
Any Engine-Driver who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500.

N. B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Government of Bengal.  
Registered,  
Port Officer of Calcutta.

\* If not known exactly must be stated on the best information or evidence.



APPENDIX TO

# The Calcutta Gazette.

WEDNESDAY, FEBRUARY 12, 1890.

[Second Publication.]  
PUBLIC WORKS DEPARTMENT.—MARINE.

NOTIFICATION.

No. 23 Marine, dated Calcutta, the 30th January 1890.

UNDER the powers conferred upon him by section 36 of the Indian Steam-ships Act, 1884, and with the previous sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to make the following rules to regulate the granting of certificates of competency to Engineers of sea-going steam-ships.

W. B. BESTIC,  
*Under-Secy. to the Govt. of Bengal.*

1. Certificates of competency will be granted to those persons who pass the requisite examinations, and otherwise comply with the requisite conditions. For this purpose Examiners have been appointed, and arrangements have been made for holding the examinations periodically at the Port of Calcutta. The examinations will be held twice a quarter, or at such other times as the Government may appoint.

2. The examinations will commence early in the forenoon, and will be continued from day to day until all the candidates who have then presented themselves and whose names appear upon the Port Officer's list on the day of examination are examined.

3. The application for examination is to be made on Form Exn. 3, which must be filled up at the Port Office. The Form Exn. 3 properly filled in, together with the Candidate's Indentures of Apprenticeship, testimonials, and discharges, must be lodged with the Port Officer not later than the day before the day of examination.

4. Applicants will be required to produce, in addition to the usual Forms of Discharge, satisfactory testimonials as to sobriety, experience, ability, and general good conduct for at least the 12 months immediately preceding the date of application to be examined, and without producing them no person will be examined. If the service has been on shore, the testimonial must be signed by an Employer; if at sea, by the Master and Chief Engineer.

5. In cases where a testimonial from the Chief Engineer, or from the Master, is for any sufficient reason not obtainable, one may be submitted from the Superintending Engineer in place of that of the Chief Engineer, and one from the Managing Owner or Secretary or Chairman of a large Company in place of that of the Master, but in every such instance the testimonial must declare that the facts stated are in accordance with the reports made by the Chief Engineer or the Master, as the case may be, or else that the facts are within the writer's personal knowledge.

6. As such testimonials may have to be verified before the Candidate can be examined, it is desirable that they should be handed in, together with the Form Exn. 3, as early as possible.

Testimonials  
of Foreigners.

7. The testimonials of servitude of Foreigners and of British Seamen serving in foreign vessels which cannot be verified by the Port Officer must be confirmed either by the Consul of the country to which the ship in which the candidate served belonged, or by some other recognized official authority of that country; or by the testimony of some credible person on the spot having personal knowledge of the facts required to be established. The production, however, of such proofs will not of necessity be deemed sufficient. Each case must be decided on its own merits; and if the sufficiency of the proofs given appears to be at all doubtful, the point must be referred to the Government.

Certificate as  
to age.

8. Should any doubt exist as to the age of a Candidate, he will be required to produce a Certificate of Birth or Baptism.

Foreigners to  
know English.

9. Foreigners must prove to the satisfaction of the Examiners that they can speak and write the English language sufficiently well to perform the duties required of them on board a British vessel.

Verification of  
services, &c.,  
by Articles.

10. Services which cannot be verified by proper entries in the Articles of the Ships in which the Candidates have served cannot be counted.

Service on a  
lake or river.

11. In addition to the required workshop time, service on a lake or river, in a steamer in which the aggregate piston area of the propelling engines proper amounts to at least 2,000 (two thousand) circular inches will be accepted towards qualifying a candidate to be examined for a certificate of competency as follows:—

Assistant  
Engineer.

Two months of river or lake service, in a capacity not lower than that of Third Engineer, may be deemed equivalent to one month of sea service, provided that,

For a Second Class Certificate, not less than three months of the qualifying service must be actual sea service, and that,

For a First Class Certificate, at least six months of the qualifying service must have been at sea in a grade not below that of Third Engineer, where an engineer of a lower grade is carried. During the last 18 months of this service the candidate must have been in possession of a Second Class Engineer's Certificate of competency.

Service in home  
or coasting  
trade.

12. Service entered upon a ship's Articles as having been performed in the capacity of Assistant Engineer must be supported by proof of the Candidate having acted as Second, Third, or Fourth Engineer, as the case may be.

Service as  
Engineer only  
accepted as  
qualifying  
service.

13. The service required by the Regulations to qualify a candidate for examination is to be regarded as referring to service in the Foreign Trade only. Service in the Home or Coasting Trade must amount to at least half as much again as that required by the Regulations to make up for the time spent in Port, e.g., for every twelve months' service under the Regulations, eighteen months' service in the Home or Coasting Trade will be required. In all cases the length of service is deemed to commence on the date of signing of the articles of agreement, and to end on the date of discharge.

Service as Third  
and Fourth  
Engineer.

14. Service in the engine-room (afterwards referred to) for qualifying a candidate to be examined for a Second-class Engineer's Certificate must be only in those capacities which afford opportunities of obtaining practical experience as an engineer; and service in the capacity of fireman, stoker, donkeyman, greaser, winchman, labourer, engineer's steward, or any other capacity than that of engineer taking watch on engines and boilers for propelling will not be accepted.

15. Service as Third and Fourth Engineer in Foreign-going steamers, where more than three or four engineers, as the case may be, are carried, their names being all entered on the Articles in their respective ratings, may be accepted equally with service as Second Engineer to qualify a Candidate for examination for a First-class Engineer's Certificate, provided he has during the whole of such service, been in possession of a Second class Engineer's Certificate (Imperial, or under Order in Council), and provided also that he was regularly in charge of a watch. In the case of Fourth Engineers, however, eighteen months of such service must be proved for every twelve months required by the Regulations.

16. Service in a capacity below that of Fourth Engineer Service below the grade of  
cannot be accepted as qualifying for any class of certificate Fourth  
unless the testimonials of the candidate explicitly certify that Engineer.

during such service he has been taking regular watch in the engine-room, and that the Chief Engineer or Superintending Engineer considers him properly qualified by that experience to act as Chief Engineer of a Foreign-going steamer of 99 horse-power nominal. *In any case the applicant must prove that he has had the responsible charge of the engines or boilers on regular watch for at least twelve months of sea service, of which for not less than six months he must have been in charge of the propelling engines and rated on the articles not lower than Fourth Engineer.*

17. Having "responsible charge" will be understood to imply, in regard to the engines, that the applicant, for the time specified, was, on regular watch, the person responsible for carrying out the orders of the engine-room telegraph, and, in regard to the boilers, that he was, similarly for the period specified, the person responsible for regulating the feeds.

18. When the workshop service has been performed in a Workshop place where steam-engines are not made, and the class of work service. done is similar to that required in engine-making, the service may be accepted with an additional year in the engine-room; that is, three years' workshop service and two years in the engine-room, of which one year must have been at sea. The approval of the Government must be obtained in every such case before the authority to receive a certificate is issued by the Examiners.

19. When the workshop service has been performed in a place where engines are made, and the department in which the applicant has been principally engaged is not "fitting" or "erec<sup>i</sup>ng," if the nature of the service be such as is useful training for an Engineer, the Government may, on proper representation of the circumstances, see fit to accept the service as qualifying along with subsequent experience, but in every such case the applicant must prove additional engine-room service as required above. The approval of the Government must likewise be obtained.

20. If a candidate has served in the Engine Room with a Second class Certificate in the capacity of a Second Engineer in Foreign-going Steam-Ships under 100 horse-power, or in Home Trade Passenger Steam-Ships, which are not required by law to carry a certificated Second Engineer, his service may be accepted without reference to the vessel's horse-power, provided he has been on the ship's articles as Second Engineer, and produces certificates of discharge as Second Engineer, for the required period.

21. The Government may see fit to allow an applicant who, in consequence of service abroad, has been unable to obtain a Second-class Certificate, to be examined for a First-class Certificate, although he has not obtained a Certificate of the lower grade, provided he is able to satisfy them as to the satisfactory character of his services.

22. In such cases (para. 21) or in cases where the candidate is already in possession of a Certificate of Service, should he fail to pass the examination for the higher grade, but passes the examination for the lower grade, he may receive a Certificate accordingly, but no part of the fee will be returned.

23. A candidate who under the above regulation (para. 21) has been permitted to be examined for a First-class Certificate without first obtaining a Second-class Certificate of Competency, and who fails in his examination in practical knowledge, may not be re-examined for a Certificate of the higher grade until he has served 12 months as Second Engineer with a Second-class Engineer's certificate of competency as required by the Regulations.

24. If the candidate fails altogether, i.e., both in the examination for the lower as well as for the higher grade of Certificate (para. 21), he may be re-examined for a *Second-class Certificate only*, subject to the usual regulations relating to failure.

If after passing examination services are found to have been insufficient.

Certificate of lower grade may be granted on certain conditions.

May have to be re-examined for certificate of higher grade.

Qualification of candidate for Second-class Engineer's Certificate.

25. If after a Candidate has passed his Examination it is discovered on further investigation, e.g., by verification on the part of the Port Officer, that his services are insufficient to entitle him to receive a Certificate of the grade for which he has passed, it will not be granted to him; but if the Government are satisfied that the error in the calculation of his services did not occur through any fault or wilful misrepresentation on his part, the Certificate may be issued to him, or he may be allowed to go up for re-examination without payment of further fee, when he has performed the amount of service in which he was deficient as the Government may direct.

26. If, in such a case, the applicant's services are sufficient to entitle him to receive a Certificate of a lower grade, provided as aforesaid he has not wilfully misrepresented the amount of his services, an Inferior Certificate may be granted to him, and the difference between the fee paid by him for the Superior Certificate and the fee payable for the Inferior Certificate may be placed to his credit.

27. In such a case when the applicant has by further service made up the time in which he was found to be short, he may be required, before he can receive the higher certificate, to be re-examined in all the subjects.

#### Qualifications for Certificates of Competency.

28. SECOND-CLASS ENGINEER — A candidate for a Second-class Engineer's certificate must be not less than 21 years of age;

- (a) He must have served an apprenticeship to an Engineer for three years in England or five in India at least, and prove that during the period of his apprenticeship he has been employed on the making and repairing of engines:—Or if he has not served an apprenticeship, he must prove that for not less than three years in England or five in India he has been employed as a journeyman mechanic in some factory or workshop\* on the making or repairing of engines.† In either case he must also have served one year at sea in the Engine Room as an Engineer on regular Watch in the Foreign, Home or Coasting Trade‡; or
- (b) He must have served at least four years at sea in the Engine Room as an Engineer on regular Watch in the Foreign, Home or Coasting Trade.
- (c) He must be able to give a description of boilers, and the methods of staving them, together with the use and management of the different valves, cocks, pipes, and connections.
- (d) He must understand how to correct defects from accident, decay, &c., and the means of repairing such defects.
- (e) He must understand the use of the barometer, thermometer, and salinometer, and the principles on which they are constructed.
- (f) He must state the causes, effects, and usual remedies for incrustation and corrosion.
- (g) He must be able to state how a temporary or permanent repair could be effected in case of derangement of a part of the machinery, or total break-down.
- (h) He must write a legible hand, and understand the first five rules of arithmetic, and decimals, and their application to questions about consumption of stores, and full capacities of tanks and bunkers, the duty of pumps, and the direct strains in engines and boilers.
- (i) He must be able to pass a creditable examination as to the various constructions of paddle and screw engines in general use; as to the details of the different working parts, external and internal, and the use of each part.

\* No period of service in a drawing office can be allowed to count for more than six months workshop time.

† These may be either land or marine engines.

‡ See paragraph 15 as to service in Home or Coasting Trade.

29. FIRST-CLASS ENGINEER.—A candidate for a First-class Engineer's Certificate must be not less than 22 years of age.

30. In addition to the qualification required for a Second-class Engineer—

- (a) He must either possess, or be entitled to, a First-class Engineer's certificate of service; or, in the event of his not being so possessed or entitled, he must have served for one year at sea as Second Engineer with a Second-class Engineer's Certificate of Competency, or for two years at sea as Second Engineer with a Second-class Engineer's Certificate of Service; or having served one year at sea as Second Engineer with a Second-class Engineer's certificate of Service, he must show, in addition, at least six months' service as Chief Engineer in a vessel required by law to carry at least one Engineer holding a certificate. (*See also paragraph 15 as regards service as Third and Fourth Engineer.*)

The Examiner should therefore be satisfied that an applicant for a First-class Engineer's Certificate has not only been *in possession* of a Second-class Certificate for the periods above stated, but that he has actually *served* for such periods in the Engine Room at sea with a Second-class Certificate in the capacities referred to, and that his name has been entered in the articles of agreement accordingly. (*See also para. 21.*)

- (b) He will be required to make an intelligible hand sketch, or a working drawing of some one or more of the principal parts of a steam-engine; and to mark in, without a copy, all the necessary dimensions in figures, so that the sketch or drawing could be worked from.\*
- (c) He must also be able to take off and calculate indicator diagrams.
- (d) He must be able to calculate safety-valve pressures and the strength of the boiler shell, stays, and riveting.
- (e) He must be able to state the general proportions borne by the principal parts of the machinery to each other, and to calculate the direct stress, the torsional stress, and the bending stress in round bars, and the direct stress and the bending stress in rectangular bars with given loads.
- (f) He must be able to explain the method of testing and altering the setting of the slide valves, and to sketch about what difference any alteration in the slide valve will make in the indicator diagram, and also the method of testing the fairness of shafts and of adjusting them.
- (g) He must be conversant with surface condensation, superheating, and the working of steam expansively.
- (h) His knowledge of arithmetic must include the mensuration of superficies and solids and the extraction of the square root, and the application of these rules to questions relating to the power, duty, and economy of engines and boilers, and to the stresses in rods, shafts, and levers of the engine.

#### Service in the Royal Navy.

31. Engineers and Assistant Engineers of the Royal Engineers and Navy are at liberty to apply for Certificates of Service, and to be examined for Certificates of Competency in the Merchantile Marine; but they must submit their applications in the manner directed by the Lords Commissioners of the Admiralty.

32. As regards the grades of Certificates of Competency for which Officers of the Royal Navy can be examined, the rule is—"First-class Assistant," or "Assistant Engineers" of the Royal Navy may be examined for Second-class Engineers' Certificates of "Competency"; "Engineers" of the Royal Navy for First-class Certificates of Competency.

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\* See Appendix B.

Temporary  
service in the  
Royal Navy.

Engineer  
Artificer.

Fees to be paid  
by applicants  
for examination.  
(Exn. 17)

33. Temporary active service as Engineer in the Royal Navy counts in applications for Certificates of Competency in the same way and to the same extent only as in the case of the service of Mercantile Marine Engineers, that is to say, so much of the applicant's time as is spent in active service at sea, or in a ship commissioned for sea service, counts as "sea service;" and so much of the applicant's time as is spent in active service on boardship in harbour, and not commissioned for sea, counts as workshop time—See paragraph 28, sub-section (a).

34. Service performed in the capacity of Engineer Artificer may count to qualify a Candidate for examination for a Second-class Engineer's Certificate of Competency in the Mercantile Marine. If the service has been on shore, it will count only as workshop time. If in the Engine Room at sea, the Candidate must prove that during such service he had charge of an Engine Room watch.

#### Fees.

35. Candidates for examination, in making their Application on Form Exn. 3, will be required to pay the Examination fees before any step is taken, whether by inquiring into their services or testing their qualifications, &c. No part of the fee will under any circumstances be returned to them, but should it be found that their service is not sufficient to entitle them to be examined, or that their testimonials are unsatisfactory, they will be allowed to present themselves for examination without paying any further fee, when they have fulfilled the requisite service, or are able to produce satisfactory testimonials, as the case may be.

36. The fee for examination must be paid to the Port Officer. In any case in which a candidate offers money to any other officer, and in any place but in the Port Office, the candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be examined for twelve months.

37. If a candidate fails in his examination, *no part of the fee he has paid will be returned to him.*

38. The fees are as follow:—

Second-class Engineer's Certificate	... Rs. 12
First-class Engineer's Certificate	... " 24
First-class Engineer's Certificate if can- didate is already in possession of a Second-class Certificate of competency granted by the Board of Trade, or by the Government of a British posses- sion under Section 8 of the Merchant Shipping (Colonial) Act, 1869	... " 12
Renewal of any certificate	... " 5

#### General Rules as to Examinations.

Candidates not  
to take books,  
&c., into exam-  
ination room

39. All books necessary for the use of candidates under examination will be provided by the Government, and applicants are not permitted to take into the examination room any book, paper, document, or memoranda of any description whatever.

40. Candidates will be allowed in the time allotted to cancel any part of their work, and when required additional papers will be supplied by the Examiners, but they will not be allowed to work out the problems on a slate or on waste paper. The additional sheets must be attached to, and form part of, the examination papers.

41. Candidates for First-class Certificates have to pass an examination in Rough Working Drawing, which may, at the candidates' option, be either hand sketches clearly dimensioned and complete in the necessary *views* and *sections*, or drawings to a scale. Drawing boards and T squares will be provided by the Government, but the applicants will have to bring with them any drawing instruments they may require.\*

\* See Appendix B.

42. In the event of any candidate being discovered copying from another, or affording any assistance or giving any information to another, or communicating in any way with another during the time of examination, he will be regarded as having failed in his examination, and will be turned back for three months, in the same manner as if he had failed in the practical part of the examination ; and no part of the fees he may have paid for examination will be returned to him. This penalty also applies to any breach of paragraph 34.

43. If a candidate leaves the room before answering any question which has been given to him, he cannot afterwards be permitted to answer it, but the Examiners may substitute other data or another question.

44. All applicants presenting themselves for examination will be required to give written answers to ten questions selected from Form Exn. 15a,\* "Elementary Questions for the first examinations of Engineers for certificates of competency, and of Masters and Mates for certificates in steam." These questions are intended to furnish a record to some extent of the candidate's knowledge at the time of his examination, and also to induce the candidates to pay more attention to their handwriting and spelling.

45. The Form Exn. 15b., on which these answers will be written, contains also some questions as to the experience of the applicant, to be answered by him in writing.

46. Examiners may add to their *vivâ voce* questions on the practical management of steam-engines and boilers any of those contained in Exn. 15a.

47. If at the expiration of the time allowed the candidate has worked out and answered correctly the whole of the questions set to him, and given satisfactory answers in the *vivâ voce* examination, he will be declared to have passed.

48. If at the expiration of the time allowed he has not worked out the whole of the questions set to him, but if the result of the *vivâ voce* examination taken in connection with the answers to such of the questions as he has worked out is sufficient to satisfy the Examiners that the applicant is competent to take charge of engines of 100 nominal horse power or upwards, he will be declared to have passed.

49. In other cases he will be declared to have failed.

50. A report of the examination, and the examination papers, will be forwarded to the Port Officer on the Form (Exn. 15.)

51. If the candidate passes, he will receive the Form Exn. 16, upon which the Government will issue the certificate to the candidate, whose testimonials, &c., will be returned at the same time.

Notification of having passed will be given to successful candidates.  
(Exn. 16.)

#### Failure.

52. If the applicant fails in practical knowledge, he may not present himself for re-examination until he can produce proofs of THREE MONTHS' further service at sea as Engineer from the date of failure. If he fails in arithmetic or drawing only, he may come up again at any time.

#### General.

53. Certificates of Competency shall be made and issued by the Government in the forms hereunto annexed.

54. Every Certificate of Competency shall be made in duplicate, and one copy shall be delivered to the person entitled to the Certificate, and the other shall be kept and recorded by the Port Officer of Calcutta.

55. No application from the holder of a certificate granted by the Government of any other British Possession or by the Board of Trade to be examined for a certificate of the same legal value shall be entertained.

## APPENDIX A.

## Form Exn. 15a.

**Elementary Questions for the First Examinations of Engineers for Certificates of Competency and of Master and Mates for certificates in steam.**

TO ENGINEER EXAMINERS.

EXAMINERS will require all candidates to fill up a form, Exn. 15b., of which a copy is enclosed, and they will forward the same to the Port Officer for transmission to the Government along with the report of the examination.

It is intended to issue questions of a more advanced character for first-class candidates, but in the meantime the questions for both classes of Engineers and also for Masters and Mates passing a Voluntary Examination in steam will be taken from the same book of "Elementary Questions," and candidates for first-class certificates are expected to show their superiority by giving answers more complete than those of the other candidates.

The arithmetical questions for Engineers and the *vivā voce* examinations for all candidates will be continued as heretofore, and failure in the elementary questions will be treated as failure in arithmetic.

The numbers of the questions for each examination will be selected by the examiners, and they are not to be communicated to the candidate until his examination commences.

Masters and Mates may cancel questions A, B, and C, but they should fill up the form for questions D, E, F, and G, as evidence of their practical knowledge.

**Exn. 15b.**

Port	Class for which examined
Date	Candidate's name

- A. Where and how long did you serve in works at the making or at the repairing of Engines, and in what capacities?
- B. How long have you served as fireman or trimmer?
- C. How long have you served in the engine-room at sea, and in what capacities?
- D. With what descriptions of Engines have you served at sea—Paddle or Screw or both, Jet Condensing, Surface Condensing, or Non-condensing Engines, Compounds, Trunks, Inverted Cylinders, or Horizontal Engines? What size were the engines?
- E. With what descriptions of Boilers have you served at sea—Rectangular or Cylindrical, Wet-bottomed or Dry-bottomed, Multitubular, Sectional or Flue Boilers?
- F. What Engine defects have come under your notice at sea, what caused these defects, and how were they remedied? Give the names of the Steamers for verification.
- G. What Boiler defects have come under your notice at sea, what caused these defects, and how were they remedied? Give the names of the Steamers for verification.

For the questions to be answered on the following pages, see the book of Elementary Questions. The questions need not be written; only the answers to them.

Question No.

#### ELEMENTARY QUESTIONS.

1.

What parts of an engine are generally made of wrought-iron?

2.

What parts of an engine are generally made of cast-iron?

3.

For what parts of an engine is steel sometimes used?

4.

What parts of an engine are generally made of brass or gun-metal?

5.

Where is "white metal" sometimes used? On account of what property possessed by it is it adopted? What objection is there to its more general use?

6.

For what parts is Muntz metal sometimes used? Is it malleable?  
For what properties is it valued?

7.

What difference is there in the composition of cast-iron, of wrought-iron, and of steel?

8.

How can cast-iron, wrought-iron, and steel be distinguished from each other?

9.

What are the different properties of cast-iron, of wrought-iron and of steel?

10.

What is meant by the terms "breaking stress," "proof stress," "safe working stress"?

11.

What is the cohesive strength or breaking stress of good ordinary wrought-iron?

12.

Tempering steel: how is it done, and in what order do the colours come?

13.

What is case-hardening?

14.

Which of the common metals or alloys can be forged, and which of them are brittle or "short"?

15.

What is meant by "welding"? Which of the common metals can be welded?

16.

The expansion of metals by heat: give examples of this in the engine and in the boiler.

17.

In the construction of cylindrical marine boilers, for what parts have the plates to be worked hot? When the material is steel, what precautionary treatment of these plates is afterwards necessary?

18.

What is double riveting? In what parts of cylindrical marine boilers is double riveting employed? In which of the shell seams is it most necessary?

19.

What is "caulking," and how are seams prepared for caulking?

20.

Describe the different ways of fastening the ends of the main stays of a boiler. What are the merits of, or objections to, the different plans?

21.

What strain per square inch is allowed on boiler stays?

22.

Describe a riveted stay, and state where such stays are commonly used.

23.

Where are thin plates to be looked for in a boiler as it wears, and how is the thinness to be detected?

24.

How are boiler tubes fixed? What are "stay tubes," and how are they secured?

25.

Where is it generally that boiler tubes leak? How is this defect raised? What are the causes of this leaking?

26.

What are the causes of cracked tube plates? Where are the cracks situated? How are they repaired?

27.

What is the difference between a "dry uptake" and a "wet uptake"? Which requires most repair? Why? Where have you seen a wet uptake?

28.

What is a superheater? What is its construction? What valves are on it? There is sometimes a gauge glass on it; what is that for?

29.

What parts of a marine tubular boiler are first injured by shortness of water?

30.

Where are angle irons sometimes used in the construction of a boiler, and where are flanged plates used?

31.

Priming: to what causes is it attributed? What means are applied to prevent it? What evils may be produced by it?

32.

Funnel draught: what makes it? What checks it?

33.

Flame is sometimes seen at the top of the funnel: what causes this appearance? Is it beneficial or is it detrimental? Why so?

34.

A blast pipe: what is its construction? Where is it placed? For what is it used?

35.

How many bottom blow-off cocks are generally fitted to each boiler, and why are they so fitted?

36.

Blow-off cocks are sometimes fitted with a spanner guard: for what purpose is this? Describe how the guard is formed?

37.

Test cocks or water-gauge cocks: where are they placed? At what heights? Must the cocks themselves be at those heights? What provision is made for cleaning these cocks should they ever become choked? When there are no test cocks how is the height of the water ascertained?

38.

What is a dead-weight safety valve? Of what are the rubbing surfaces formed? How is a lock-up valve arranged to admit of lifting it or of turning it round, and to prevent adding to the weight?

39.

About what area of safety valve is now required by the Board of Trade? What area was formerly required, and on what ground has that been altered? What is the effect of suddenly opening a safety valve when steam is up? To about what extent do safety valves rise when blowing off without being eased by hand?

40.

Spring-loaded safety valves: what advantages have they that are not possessed by dead-weight valves? What are the disadvantages as compared with dead-weight valves?

41.

Of what pieces does a glass water gauge mounting consist? How does it act? Where is it placed? At what height? Is it liable to derangement? How is its working tested?

42.

Glass water gauges have sometimes pipe connections top and bottom: what is the object of this arrangement? Should there be cocks at the extremities of these pipes?

43.

Describe a Bourdon's steam gauge. Some gauges have an inverted siphon pipe below them: what is its use?

44.

Why is a small cock sometimes put on the pipe leading to a steam gauge? Where should it be placed, and what error might be made by omitting to use it?

45.

Do steam gauges indicate the total pressure of the steam, or only a portion of that pressure? What is the pressure measured from?

46.

What is meant by the salting of the boiler? How is this prevented? What is the density of ordinary sea water? How is the density ascertained? What is the difference between the formation of scale and the salting of the boiler? What is the maximum density at which boilers should be worked at sea?

47.

Scum cocks and pipes: how are they arranged? Where are they placed? At what height in the boiler? When are they used? When must they be shut? Neglect of these cocks lead to what dangers?

48.

Scale: of what does it consist? Where is it most objectionable? How is it removed? How is its formation prevented? What evil effects are produced by it?

49.

What is a salinometer? Of what does it consist? How does it act? How is it graduated? Can it be used at any temperature indiscriminately?

50.

What harm may be done through the check valve of one of a set of boilers being defective while under way? How would you work to avoid this harm?

51.

How is the leak from a split tube stopped in a boiler at sea? Describe the operation?

52.

What is the use of dampers? Where are they fitted? When should they be used?

53.

When there are no dampers fitted, what is used instead? What evil to the boiler is sometimes attributed to this? When the heating surfaces are clean does this occur?

54.

Describe the piston of a steam cylinder, with its different rings and their uses? There are generally round pieces let in flush on one side of a piston: what are they? How are these pieces fixed?

55.

Cylinder drain cocks: what is their use? There is sometimes a valve upon each cock: what purpose does it serve?

56.

Cylinder escape valves: of what do they consist? How protected? How regulated? When are they most needed? To what danger do they expose the Engineer? What precaution is sometimes used to obviate this danger?

57.

What is a compound engine? What different kinds are there for screw steamers, in respect to the number and arrangement of their cranks and cylinders? What is a triple expansion engine?

58.

What is link motion? What are some of its advantages? In modern engines for the screw propeller when there is no link motion, what takes its place?

59.

What is a separate expansion valve? Why is it not fitted to all engines? What effect has an expansion valve upon the starting and upon the reversing of the engine?

60.

What arrangement is applied to reduce the friction of a slide valve? To what is the friction due?

61.

Describe a loose eccentric; how does it act? In what engines is the loose eccentric still employed?

62.

What is the travel of the eccentric rod? How is it measured on the eccentric? What is the travel of the slide valve when the link motion is in mid gear, and the engine still moving?

63.

What are "double beat valves"? Why are they not generally used for safety valves? Are they ever used instead of the slide valve? What objections are there to their use?

64.

What is a circulating pump? Is it always worked by the main engine? Give an example from your last steamer of the three water temperatures generally noted by careful engineers?

65.

An air valve is sometimes fitted to a circulating reciprocating pump: what purpose does it serve?

66.

What is the difference between a bucket air-pump, a piston air-pump, and a plunger air-pump?

67.

Whether are double-acting air-pumps made with plungers, with pistons, or with buckets?

68.

What is an air-pump trunk? When is it necessary? How is it attached to the bucket?

69.

What class of air-pump requires both foot and delivery valves, and in what other class can either of these valves be in some cases dispensed with?

70.

When under way, when the air-pump bucket is at the top of its stroke, at what height is the water in the condenser?

71.

With a surface condenser and a single acting air-pump, what is the effect of a leaky foot valve, and what is the effect of a leaky bucket when there is also a foot valve?

72.

Air-pump pet cock or valve: where is it placed? How does it act? What is its object? Does it in every case reduce the effective capacity of the pump? Is it equally applicable to double-acting pumps?

73.

At what temperature is the hot well worked? What is the effect of higher temperatures? What is the effect of lower temperatures? What limits the lowness of temperature? Has a very low temperature any disadvantages?

74.

Bilge injection with common condensers: what are the fittings required? When is it used? What precautions are necessary in using it?

75.

When surface condensers are used, what takes the place of the bilge injection? To what is the connection made? How is its valve formed? Why is this necessary?

76.

What are the practical guides to the proper amount of opening of the inlet valve for the circulating pump?

77.

Feed-pump pet cock or valve: where is it placed? What is its use? How does it act? Is it always a necessary fitting?

78.

What are some of the ways of fastening the ends of surface condenser tubes? About what size and about what thickness are condenser tubes? What parts of a surface condenser are made of brass?

79.

What is a blow-through valve or cock? To what is it attached? There is sometimes a valve that, when opened, admits steam from the slide valve casing to the exhaust port; what is its use? To which cylinder is it fitted?

80.

What is a shifting valve? What is its use? Where is it placed? Can it be placed too high? Can it be placed too low? At what height should it be placed? Was there one in your last steamer; if so, where was it? Why are shifting valves generally omitted now?

81.

What connections are generally fitted to the donkey-pump, and to what services can it be applied?

82.

When the engines are stopped with steam up, what are to be shut and what are to be opened?

83.

How is an engine heated up before starting? What precautionary examinations are made before starting?

84.

What is an interceptor or catch-water? Where is it fixed; what is its construction; how does it act; and what attention does it require?

85.

Describe an air-pump bucket, with its valve or valves and its packing? Of what are the valves generally made?

86.

Of what materials are air-pump rods made? Why so?

87.

What is the racing of the engine? When does it occur? What danger attaches to it? What is done to prevent it?

88.

What are marine governors? What is their general construction? How do they act?

89.

What is meant by the "pitch" of a screw propeller? How is it measured?

90.

Explain the difference between a "right hand" and a "left hand" propeller, and state how each of them revolves.

91.

What is the slip of a screw propeller? How is its amount expressed in figures?

92.

Which of the valves about engines and boilers have to be worked by hand, which of them work self-actingly, and which are worked by the motion of the engine?

93.

Why is soda sometimes put into a boiler, and how is it put in when under way? What is the kind of soda used?

94.

Tallow cups for cylinders were sometimes made with two small cocks, or with only one small cock, or with one large hollow plug cock, or with one small cock and a valve; which of these is suitable for a high-pressure cylinder, and which for the cylinder of a condensing engine? Describe how the cup with only one small cock is used? What is now generally used instead of these? How has this change come about?

95.

Does a cylinder escape valve, self-acting, allow all the water to escape; if not, how much is left in the cylinder?

96.

What is a "Steam Lubricator" (sometimes called an Impermeator)? Explain its action? To what part of the engine is it connected? Whether will throwing cold water over it make it work faster or slower? Describe the one used in your last steamer?

97.

A common paddle wheel: of what is the centre made? Of what are the arms formed? What is the form of the bolts which attach the floats to the arms? How are the arms attached to the centres?

98.

Why have some paddle wheels one or more cast-iron floats in each wheel? With what engines are these most required? At what part of the circumference are they placed?

99.

Why are paddle wheel floats sometimes made of different breadths in the same wheel? With what description of engine is this most needed? Where are the broad floats placed, and where are the narrow floats placed in the circumference of the wheel?

100.

What difference is there between a radial paddle wheel and one with feathering floats? What is the object of feathering floats? Are all the eccentric rods attached in the same way, and are they all of the same form?

101.

Whereabout is the centre of the eccentric of a paddle wheel with feathering floats placed? In that case are the feathering levers on the striking face or on the back of the float? When the paddle shaft has an outer bearing, how is the eccentric made?

102.

Of what materials are the working surfaces of a paddle wheel with feathering floats? Are they all lubricated? With what?

103.

What is a "Disconnecting Paddle Engine"? At what place is the disconnecting effected? How is it accomplished? In which of the cranks of a disconnecting engine are the crank pins fixed?

104.

Whether is link motion valve gear or the loose eccentric generally used for disconnecting paddle engines? For what steamers are disconnecting paddle engines frequently employed?

105.

What are expansion joints? Where are they necessary? What attention do they require? Of what should the working surfaces be made?

106.

What omission in the construction of expansion joints may lead to a serious accident when steam is first applied? How is this prevented in the construction of a steam trunion pipe for an oscillating engine?

107.

Describe an oil cup with a syphon worsted? How is the worsted arranged? How is it cleaned? How far down the tube does it extend?

108.

Describe a thrust bearing; which of the surfaces wears? Why are there sometimes a number of oil tubes for one thrust bearing?

109.

What parts of a screw shaft are generally covered with brass? Why is this necessary? About what thickness is the brass?

110.

What is the stern tube or screw shaft pipe? Why is a pipe of such a length required? Of what is it made? How is it fixed at each end?

111.

What is a lignum vitae bearing? How is the wood fitted? Where is such a bearing generally used?

112.

How is a screw propeller fixed on the shaft? What means are used to prevent its getting loose at sea?

113.

Where are sluice valves placed? What large sluice valve is there in almost all screw steamers? From what position should this valve be worked? Why so? What attention should it receive?

114.

With a condensing engine, what valves or cocks are on the skin of the ship in the engine-room and in the stokehole?

115.

What are the necessary fittings of a marine boiler?

116.

With a surface condensing engine, what cocks or valves are open some time before the engine is started so as to be ready for starting whenever the order is given?

117.

What is a steam jacket? What cocks are on it? In what engines are jackets most generally used? Do they require to be felted?

118.

What parts of an engine or its fittings should be felted or otherwise protected from radiation?

119.

What are the small cylinders sometimes fitted on the slide valve casing cover of vertical engines? Explain their action? To what are they connected by a pipe? Why so?

120.

Name the principal pipes in connection with the engines and boilers of a steamer, and state to what the ends of these pipes are connected?

121.

Through what cocks or valves, pipes and chambers does the water pass on its way from the sea inlet rose plate to the water space of the boiler, with a jet condenser?

122.

Through what cocks or valves, pipes and chambers does the circulating water of a surface condenser pass?

123.

Through what cocks or valves, pipes and chambers does the steam pass from the boiler until it is in the form of water in the hot well?

124.

Name the pieces of the engine through which the pressure of the steam is transmitted from the piston to the screw propeller. Name them in the order in which they act.

125.

What is an air vessel? How does it act? At what parts of an engine or of its fittings are air vessels generally applied?

126.

What is the construction of a mud box? Where should mud boxes be placed? Why are they necessary? How should the space be divided by the rose plate, and why?

127.

What is a trunk engine? When used in a horizontal engine for a right-hand screw propeller, at which side of the vessel should the cylinders be placed? Why so?

128.

What is an oscillating engine? For what steamers are oscillating engines generally adopted? Why? How is the steam conveyed to and from the slide valve casing?

129.

Of what parts does the valve motion gear of an oscillating engine consist?

130.

For what have geared engines sometimes been used? Of what were the cogs of the large wheel made?

131.

At what part of a screw steamer is the pressure that propels it applied to the hull?

132.

At what part of a paddle steamer is the pressure that propels it applied to the hull?

133.

About how much fuel per indicated horse power per hour is required by modern steam engines, common, compound and triple expansion?

134.

What is the explanation of the economy of the surface condenser?

135.

What is the construction of a surface condenser? Of what are its tubes made? How are they fixed? How are they kept tight? What is done with a split tube?

136.

Where do surface condensers foul? How are they cleaned?

137.

What non-conducting substances are employed to prevent radiation, and how are they applied?

138.

In the construction of smoke-box doors and of dry uptakes, what provision is made to lessen the amount of radiation?

139.

How can the formation of black smoke be prevented? Describe smoke preventing apparatus?

140.

What is meant by "circulation" in a boiler, and what are the results of defective circulation?

141.

What means are sometimes adopted to improve the circulation in a boiler?

142.

By what arrangement is the circulation promoted in a "haystack" boiler?

143.

Describe a ship's side air-pump discharge valve? In what respects does it sometimes differ from a common stop valve, and what attention does it require?

144.

What is the construction of a feed escape valve, to what is its discharge connected, and how is its loading regulated?

145.

When there is no feed escape valve, what is the arrangement of the feed valves or cocks?

146.

What is the measure of a horse power? How is indicated horse power ascertained?

147.

Has "nominal horse power" a fixed meaning? What is the use of this expression? What is generally taken as the measure of one horse-power nominal?

148.

What is "back pressure" in a cylinder? About how much is it in each of the cylinders in your last steamer? Is excessive cushioning ever a trouble under certain conditions in modern engines? Say when and why and in which cylinder this occurs?

149.

What is meant by "speed of piston"? About how much is the speed of piston in modern marine engines?

150.

What is "atmospheric pressure"? What is its average amount? What instrument tells this amount?

151.

What is "gross pressure" or "absolute pressure"? What pressure is it that is shown by the steam gauge?

152.

What is meant by "cutting off" steam? How is it done? What part of the valve regulates the cut off?

153.

What is a piston slide valve? Describe its construction? Why are such frequently employed in place of the common slide valve? What is a great drawback to the use of these valves?

154.

What fixes the time of closing the exhaust? After the exhaust is closed and before the port opens for steam, what becomes of the steam that is in the cylinder?

155.

What is the "lead" of the valve? What is its object? About what amount is it?

156.

What is the "cover" or "lap" of the valve? What is its object? About what proportion of the stroke of the valve is it made?

157.

What is the "exhaust cover" of a slide valve? What is its effect upon cushioning and upon exhaust?

158.

What is "minus cover" or "minus lap" on the exhaust? What is its effect upon the exhaust and upon cushioning?

159.

What is "cushioning" or "compression" in a steam cylinder? How is it affected by the amount of cover or of minus cover there may be upon the exhaust? How is it affected by the exhaust pressure?

160.

What is "mean effective pressure"? How is its amount ascertained?

161.

What is a dial vacuum gauge? What is its construction? For what is it used? About what amount should it show when the engine is working all right? What effect has the variations it indicates on the performance of the engine?

162.

Does the vacuum gauge enable you to tell what pressure there is in the condenser, or must you have recourse also to the barometer to arrive at that? How would you ascertain the actual amount of back pressure there is in the condenser?

163.

What is a barometer? What is its construction? Is a barometer sometimes used instead of a vacuum gauge? In what respect does the weather barometer differ from the vacuum gauge barometer?

164.

The common vacuum gauge and the common steam gauge: in which of them are the graduations marked from atmospheric pressure? Does either of them tell what is the true actual pressure in the boiler or in the condenser?

165.

Do steam and vacuum gauges vary with the variations of the weather barometer? When the weather barometer varies from 29 to 31, how much will the vacuum gauge vary, and how will that affect the working of the engine? Why so?

166.

Vacuum is generally stated as so many inches. What is meant by, say, 20 inches vacuum? What does that tell us about the absolute pressure of the vapour then in the condenser?

167.

From what depth will a pump draw water? Is there any limit? Why?

168.

What is vacuum? Can vacuum move a piston? When the temperature of the water in the condenser is  $212^{\circ}$ , what is the greatest degree of vacuum there can then be in the condenser?

169.

What is a thermometer; its construction? What is the property of matter that is the principle of its construction? What temperatures are regularly noted by careful engineers?

170.

What is the temperature of (1) melting ice, (2) of boiling water, (3) of steam about 60 lbs. pressure by the steam gauge, (4) of steam about 100 lbs., and (5) of strain about 150 lbs.; also (6) of smoke in the funnel, and (7) of water in the hot well?

171.

What is meant by the "conduction" of heat? Give examples of it in the boiler and in the engine.

172.

What is meant by the "convection" of heat? Give examples of it in the boiler and in the engine.

173.

What is meant by "radiation" of heat? Give examples of it in the boiler and in the engine.

174.

Which is convection, which is radiation, and which is conduction in the following cases: (1) Heat from the glowing fuel to the furnace crown. (2) Heat passing from one side of the furnace crown plate to the other. (3) Heat passing from the steam pipes in the engine-room. (4) The heat of evaporation?

175.

What are the effective heating surfaces of a marine boiler? What is an objection to vertical heating surfaces?

176.

What parts of a marine engine are exposed to danger when the temperature is below freezing point?

177.

What precautions are necessary in cold climates when the temperature is below freezing point?

178.

State as many ways as you can by which a boiler might not get its full feed; that is, a boiler, or one of a set of boilers, gets short of water although the feed valve is open its proper amount; to what causes might this be due?

179.

Of what are furnace bars generally made? About what thickness are they at top? About what space is between them? Whether are the bars put further apart for Newcastle coal or for Welsh coal?

180.

Which burns faster, Newcastle coal or Welsh coal? Which is the flaming coal? Which makes most smoke?

181.

About how many tons of steam coal will be burnt per day in four furnaces each 3' 0" wide, and of about the usual length? On what grounds do you say so?

182.

About how many tons of steam coal will be burnt per day with good compound engines to drive an ordinary steamer of 40 ft. beam 10 knots an hour by steam alone? On what grounds do you say so? What percentage more coal would be required to propel the same steamer one knot faster?

183.

About how many tons of steam coal will be burnt per day with a good compound engine, surface condensers, the low pressure cylinder 70 inches diameter, doing average work? On what grounds do you say so?

184.

A pair of inverted cylinder direct acting engines, there is a liner half an inch thick between the ahead eccentric rod and the eccentric strap, in overhauling the engine this piece is lost and forgotten; what difference will its omission make in the working of the engine, on the admission, on the cut off, and on the exhaust of the steam? Which will take place earlier, and which later distinguishing between the up stroke and the down stroke?

185.

A pair of inverted cylinder direct acting engines driving a right-hand screw; on which of the crosshead guide bars is the pressure greatest in the up stroke, and on which in the down stroke?

186.

A screw propeller is getting loose; it has a little play on the shaft, sideways on the key or feather; how will this show in the engine-room?

187.

How would you prove whether the centre line of the trunions of an oscillating cylinder be fair with the centre line of the main shaft?

188.

How can the fairness of a line of screw shafting be tested without lifting the shafts?

#### APPENDIX B.

##### Form Exn. 17.

###### EXAMINATION IN ROUGH WORKING DRAWING FOR A FIRST-CLASS ENGINEER'S CERTIFICATE OF COMPETENCY.

1. The regulations in regard to the qualifications of a candidate for a first-class Engineer's Certificate of Competency specify that—

"He must be able to make rough working drawings of the different parts of the engines and boilers."

"He must be able to state the general proportions borne by the principal parts of the machinery to each other."

2. In accordance with these clauses, a candidate for a first-class certificate is required to make a rough working drawing of the parts specified on the other side of this leaf. A mechanic who has been some years in charge of marine engines and boilers ought by this time to have familiarly in his mind the general construction of at least one set of engines and boilers, say that set he was

last with. Fine drawing is not expected, and in the proportions of the parts a wide margin will be allowed; absurd dimensions will be failure in practical knowledge.

3. The drawing must, however, be practically a working drawing, giving a sufficient number of views to show the parts fully—sections, plans, or elevations, just as the candidate would require to be supplied to him if he had to make the parts to the design of another person.

4. A clear hand sketch showing the construction, completely and fully dimensioned, will be accepted if the candidate prefers this alternative.

5. A portion only of the parts specified may be accepted in place of the whole, if that portion is sufficient to show that the candidate has a good practical idea of the construction of the parts, and a fair notion of their general proportions or dimensions.

6. Candidates are hereby cautioned not to put on paper what they have not fully considered, and deliberately intend to be understood, as their statement of what they know about the construction of any part required.

7. The statements given in by a candidate may be in themselves, apparently, of little importance, but as sample material from which the state of the candidate's knowledge of engines and boilers is to be inferred, every detail which is glaringly inconsistent with a sound knowledge of the use of the part, or in which an essential consideration has evidently been overlooked, is an important element in the description which the candidate is giving of his own qualifications.

8. The candidate is advised not to begin more than he can clearly finish in the time allowed. An important object in this part of the examination is to ascertain whether the candidate can be trusted to mark all necessary dimensions upon a sketch or a drawing. The test of this is, practically, the making of the part from the sketch without having to supply additional dimensions, and without measuring the drawing. To prove this ability the candidate must fully dimension the parts shown in his sketch or drawing, notwithstanding that the parts may be correctly drawn to scale. A drawing is fully dimensioned when no part of it is left to the option of the party who is to work to the drawing.

9. To prevent misunderstanding, however, when the candidate has been led into showing more of the details than he has time fully to finish, he should name, in the statement on the other side, the particular parts which he has fully dimensioned.

10. All dimensions should have lines and darts, to indicate distinctly the points between which the dimensions are given.

11. Beware of writing cross dimensions upon centre lines, or upon longitudinal dimension lines. This is not an order but a recommendation.

12. The candidate is not expected to design anything; he has merely to sketch or draw a something with which he is expected to be already familiar.

13. Pencil in nothing after half-past 3; all the dimensions, the figures, and the darts must be inked in; employ the remaining time in examining the drawing and in inking in any figures which may have been before overlooked, and in checking the dimensions.

14. Make sure that you will have sufficient room on the drawing sheet to show all the necessary views. You can have another sheet or drawing paper if necessary. All the paper used must be forwarded with the drawing.

15. Fill in and sign the following statement.

(Specimen.)

**Form Exn. 17a.**

**SUBJECT FOR EXAMINATION IN ROUGH WORKING DRAWING.**

*(Read the foregoing general instructions.)*

A common slide valve with its spindle. Show also an outline section of the ports at the cylinder face. Show the provision for connecting the slide valve to the spindle.

The candidate is requested to fill up the following, and to attach this paper to his drawing.

## STATEMENT BY THE CANDIDATE.

The accompanying drawing, made by me this day, without referring to any document, and without the assistance of any person, is intended by me to be sufficient for the new construction of the parts above described to fit the places of similar parts which are to be removed. The construction is similar to what I have been with in the \_\_\_\_\_ steamer \_\_\_\_\_, but the dimensions may be different.

The diameter of the cylinder is \_\_\_\_\_

The stroke of the piston is \_\_\_\_\_

The stroke of the valve is \_\_\_\_\_

The cover at top end on steam side is \_\_\_\_\_

The cover at bottom end on steam side is \_\_\_\_\_

The lead at top is intended to be \_\_\_\_\_

The lead at bottom is intended to be \_\_\_\_\_

The inside cover is + \_\_\_\_\_ or \_\_\_\_\_

The thickness of the face of valve is \_\_\_\_\_

The thickness of the body of valve is \_\_\_\_\_

The greatest opening for steam will be \_\_\_\_\_

That gives an area equal to one \_\_\_\_\_

The opening for exhaust when the crank is on the top centre is \_\_\_\_\_

That gives an area equal to \_\_\_\_\_ th of piston.

The length of the connecting rod is \_\_\_\_\_

The valve will cut off steam on the down stroke at \_\_\_\_\_

The valve will cut off steam on the up stroke at \_\_\_\_\_

*The Candidate  
may omit this  
part if he  
chooses.*

The parts fully dimensioned, in ink, are \_\_\_\_\_

Dated at \_\_\_\_\_

this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_

\_\_\_\_\_  
Applicant.

BENGAL.

Government of  
Bengal.

In accordance with Her Majesty's order in Council of the 29th June 1882, issued  
under section 8 of the Merchant Shipping (Colonial) Act, 1869.

**Colonial Certificate of Competency**

AS

**FIRST CLASS ENGINEER.**

To

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the duties of FIRST CLASS ENGINEER in the Merchant Service, I do hereby, in pursuance of Act VII of 1884, grant you this Certificate of Competency.

By order of the Government of Bengal,  
this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_

Under-Secy. to the Govt. of Bengal.

BENGAL.No. of CertificateAddress of Owner.Date and Place of Birth.Signature

This Certificate is given upon an ORDINARY EXAMINATION passed at \_\_\_\_\_ on the \_\_\_\_\_  
day of \_\_\_\_\_ 18 \_\_\_\_\_

*Any ENGINEER who fails to deliver up a Certificate which has been cancelled or suspended, is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic., cap. 63, sec. 23, to cancel or suspend Certificates.*

*N.B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.*

Issued at the Port of Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_

*Registered,  
Port Officer of Calcutta.*

BENGAL.

Government of Bengal.

By the Honourable the Lieutenant-Governor of Bengal,  
In accordance with Her Majesty's order in Council of the 29th June 1832, issued  
under section 8 of the Merchant Shipping (Colonial) Act, 1869.

## Colonial Certificate of Competency

A.S.

## SECOND CLASS ENGINEER.

To

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the duties of SECOND CLASS ENGINEER in the Merchant Service, I do hereby, in pursuance of Act VII of 1884, grant you this Certificate of Competency.

By order of the Government of Bengal,

this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.

Under-Secy. to the Govt. of Bengal

BENGAL.Ex. of Certificate

Address of Owner  
Date and Place of Birth  
Signature

This Certificate is given upon an ORDINARY EXAMINATION passed at \_\_\_\_\_ on the \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_.  
 \_\_\_\_\_

Any ENGINEER who fails to deliver up a Certificate which has been cancelled or suspended, is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic, cap. 63, sec. 23, to cancel or suspend Certificates.

N.B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.

Issued at the Port of Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_.  
 \_\_\_\_\_

Registered,  
 Port Officer of Calcutta,

## NOTIFICATION.

No. 24 Marine, dated Calcutta, the 30th January 1890.

UNDER the powers conferred upon him by section 36 of Act VII of 1884 (the Indian Steam-ships Act), and with the previous sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to make the following rules to regulate the granting of certificates of competency to engine-drivers of sea-going steam-ships having engines of under 50 nominal horse-power.

W. B. BESTIC,  
*Under-Secy. to the Govt. of Bengal.*

1. Certificates of competency will be granted to those persons who pass the requisite examinations and otherwise comply with the requisite conditions. For this purpose examiners have been appointed and arrangements have been made for holding the examinations periodically at the port of Calcutta. The examinations will be held twice a quarter, or at such other times as the Government may appoint.

2. The application for examination is to be made in Form Exn. 3a, which must be filled up at the Port Office. The Exn. 3a properly filled in, together with the candidate's testimonials, must be lodged with the Port Officer not later than the day before the day of examination.

3. A candidate for a certificate of competency under these rules must be not less than 22 years of age.

4. He must have served three years as principal serang or tindal in the engine-room of a sea-going steamer under a certificated Engineer.

5. He must have the testimonial shown in Appendix A filled up by the Engineer with whom he has last served, or his other testimonials must contain all the particulars therein required.

6. He must pass a *riv& voce* examination before the Board of Examiners as to the working of an engine and the use of its different parts.

7. He must, if required, be able to show his practical qualifications by one week's trial in a steamer, after fulfilling the other tests to which he will be subjected.

8. He must show a knowledge of the use of brine cocks and blowing off, of the salinometer, and of the care of the boiler in salt-water.

9. Candidates for examination, in making the application on Form Exn. 3a, will be required to pay the examination fee before any step is taken, whether by enquiring into their services or testing their qualifications, &c. No part of the fee will under any circumstances be returned to them; but should it be found that their service is not sufficient to entitle them to be examined, or that their testimonials are unsatisfactory, they will be allowed to present themselves for examination without paying any further fee, when they have fulfilled the requisite service or are able to produce satisfactory testimonials, as the case may be.

10. The fee for examination under these rules is ten rupees, and the amount must be remitted with the application to the Port Officer. In any case in which a candidate offers money to any other officer than the Port Officer, and in any place but the Port Office, the candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be examined for twelve months.

11. If a candidate fails in his examination, *no part of the fee he has paid will be returned to him.*

12. In case of failure, candidates may be re-examined *de novo* after a lapse of six months, if the past examination showed that they might reasonably be expected to qualify.

13. Certificates of competency shall be made and issued by the Government in the form hereunto annexed.

14. Every certificate of competency shall be made in duplicate, and one copy shall be delivered to the person entitled to the certificate and the other shall be kept and recorded by the Port Officer of Calcutta.

APPENDIX A.  
TESTIMONIAL.

I hereby certify that has served with me in the engine-room of as principal serang or tindal for a period of , during which time he has discharged his duties to my entire satisfaction.

I consider that he fully understands the working of an engine, and has sufficient tact, presence of mind, and energy to look after and manage the working of the engines of a sea-going steamer having engines of under 50 nominal horse-power.

Signed  
No. and description of Certificate.

---

Note.—Any Engineer giving a testimonial in this form should be very careful in doing so, as the document may materially influence the applicant's eligibility as a candidate.

By the Honourable the Lieutenant-Governor of Bengal.



Government of  
Bengal.

Certificate of Competency

48

ENGINE-DRIVER OF A SEA-GOING STEAM VESSEL UNDER ACT VII OF 1884.

**W**

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the duties of Engine-driver on a sea-going Steam-ship having engines of under 60 nominal horse-power, I do hereby, in pursuance of Act VII of 1884, grant you this CERTIFICATE OF COMPETENCY as Engine-driver.

By order of the Government of Bengal,

Given under my Hand and Seal,

The \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_. Under-Secretary to the Govt. of Bengal."

## No. of Certificate

Bearer \_\_\_\_\_ son of \_\_\_\_\_ by caste \_\_\_\_\_  
Date\* and Place of Birth, showing Village, Thana and District \_\_\_\_\_  
Residence, showing Village, Thana and District \_\_\_\_\_  
Height \_\_\_\_\_  
Personal description, stating particularly any permanent marks or scars \_\_\_\_\_  
No. of Register Ticket \_\_\_\_\_  
Signature \_\_\_\_\_  
Any Engine-driver who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500.  
N. B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer of Calcutta.  
Issued at Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
Registered.

Port Officer of Calcutta.

\* If not known exactly, must be stated on the best information or evidence.

## NOTIFICATION.

No. 25 Marine, dated Calcutta, the 30th January 1890.

UNDER section 10 of the Indian Merchant Shipping Act, 1859, the Lieutenant-Governor is pleased, with the sanction of the Governor-General in Council, to make the following rules for the conduct of examinations for Masters and Mates of foreign-going ships and as to the qualifications to be required. These rules are in supersession of the rules issued under the notification dated the 28th of August 1877.

W. B. BESTIC,

*Under-Secy. to the Govt. of Bengal.*

Certificates granted to persons who pass examinations.

Examinations continued till all the Candidates are examined.

Notice of application for examination to be given to the Port Officer.

Testimonials of character, conduct, and ability required.

Testimonials of Foreigners.

Certificates as to age.

Foreigners to know English.

Verification of services, &c., by Articles

1. Certificates of Competency will be granted to those persons who pass the requisite examinations, and otherwise comply with the requisite conditions. For this purpose examiners have been appointed, and arrangements have been made for holding the examinations periodically at the port of Calcutta. The examinations will be held twice a quarter, or at such other times as the Government may appoint.

2. The examinations will commence early in the forenoon, and will be continued from day to day until all the Candidates whose names appear upon the Port Officer's list on the day of examination are examined.

3. Candidates for examination must make their application upon the appropriate Form (Exn. 2), which must be filled up at the Port Office. The Exn. 2, properly filled in, together with the Candidate's testimonials and discharges, must be lodged with the Port Officer of Calcutta not later than the day before the day of examination, and the Candidate must conform to any regulations in this respect which may be laid down by the Government, as, if this be not done, delay may be occasioned.

4. Testimonials of character, and of sobriety, experience, ability, and good conduct on board ship for at least the twelve months of service immediately preceding the date of application to be examined, will be required of all applicants, and without producing them no person will be examined. As such testimonials and discharges may have to be verified before the Candidate can be examined, it is desirable that they should be handed in together with the Form, Exn. 2, as early as possible.

5. The testimonials of servitude of Foreigners, and of British Seamen serving in foreign vessels, which cannot be verified by the Port Officer, must be confirmed either by the Consul of the country to which the ship in which the Candidate served belonged, or by some other recognized official authority of that country, or by the testimony of some credible person on the spot having personal knowledge of the facts required to be established. The production, however, of such proofs will not of necessity be deemed sufficient. Each case will be decided on its own merits, and if the sufficiency of the proofs given appears to be at all doubtful, it must be referred to the Government.

6. Should any doubt exist as to the age of a Candidate, he will be required to produce a certificate of birth or baptism.

7. Foreigners must prove to the satisfaction of the Examiners that they can speak and write the English language sufficiently well to perform the duties required of them on board a British Vessel. In the case of natives of India, who may not be able to speak English, their Certificates will be endorsed to the effect that they are only valid for vessels manned and officered entirely by Asiatics.

8. The time for which length of service as Seaman or Officer in the Mercantile Marine is to be reckoned in all cases referred to in the following paragraphs is to commence at the date when the Articles of Agreement were signed by the Applicant, and to end at the date when he was discharged as shown on the Articles of Agreement. The Certificates of Discharge will generally be sufficient evidence of this, but great care must be exercised by the Port Officer and Examiners to detect any tampering in any way with the information contained in them, and to report to the Government at once any suspicious cases.

9. Services, which cannot be verified by proper Entries in the Articles of the Ships in which the Candidates have served, cannot be counted. For instance, a man will state his

service to have been as Second or Only Mate, and to support his assertion will produce a Certificate of Discharge or of employment by the Master, to the effect that he served as Mate, when, on reference to the Articles, it appears that he has actually been rated as Boatswain; the service in such a case will not be regarded as having been in the capacity of Mate.

10. Whenever a man has, from any cause, been regularly promoted on a vacancy in the course of the Voyage from the rank in which he first shipped, and such promotion, with the ground on which it has been made, is properly entered in the Articles and in the Official Log Book, he will of course receive credit for his service in the higher grade for the period subsequent to his promotion. Promotion during Voyage

11. Service in the coasting trade may be allowed to count as service, in order to qualify a Candidate for examination for a Certificate of Competency for Foreign-going Ships, it being understood, however, that service in the coasting trade must amount to half as much again as service in the foreign trade, and that service in a lower grade than that of First or Only Mate in the coasting trade will not be recognised as officer's service. Service in the coasting trade

12. Three years' service as Mate in the coasting trade, together with at least nine months' service as Master, may be allowed to count as service for a Master's Certificate, provided the Candidates' entire service at sea calculated as above is sufficient, and that his services as Mate and Master in the coasting trade can be proved by the Articles, and provided he has already passed an examination *for the Foreign Trade*, unless, under special circumstances, the Government see fit to dispense with this latter provision.

13. Service in Pleasure Yachts under 80 tons, if performed within Home Trade limits, will not be accepted towards qualifying a Candidate for examination.

14. Service in Pleasure Yachts will not be accepted at all unless verified by satisfactory proofs, and it must be distinctly understood that accepted service is confined to *actual sea service*, service in harbour or port being inadmissible. See also para. 21.

15. Time for which Indentures of Apprenticeship are in force will be accepted as sea service, provided that the Apprentice has remained by the ship for at least four-fifths of the time covered by the Indentures, and the Indentures of the applicant are endorsed by the Owner or Master to whom he has been bound, to the effect that he has performed his service faithfully for the whole time agreed upon. Service as an Apprentice.

16. Service as Third or Fourth Mate may be accepted as equivalent to service as Second Mate to qualify a Candidate for examination for a Certificate of Competency as First Mate, provided he is able to produce a satisfactory testimonial from the Master or owner of the vessel in which the service was performed, showing that he has had charge of a watch while serving as such Third or Fourth Mate, and that during the whole of the time claimed he was in possession of a Second Mate's Certificate of Competency, valid in the United Kingdom. Service as 3rd or 4th Mate to qualify for 1st Mate.

17. Service as Third or Fourth Mate may also be accepted on the same conditions to qualify a Candidate for examination for a Master's Certificate of Competency, provided he can produce satisfactory evidence of his having served at sea 12 months as Second Mate of a Foreign-going Ship while in possession of a First Mate's Certificate of Competency, valid in the United Kingdom. If a Candidate has had no service as First Mate he must have been six and-a-half years at sea, of which two and-a-half years must have been as Mate of a lower grade under the above-named conditions. It will also be noted that occasional service in charge of a watch in the daytime will not be accepted as Mate's service under the Regulations. Service as 3rd or 4th Mate to qualify for Master.

18. Part of the time served on board a training ship will be allowed to count as service at sea, provided that the Candidate can produce amongst his testimonials a Certificate from the Committee that he has conducted himself creditably, and passed a good examination in seamanship so Service on board a Training Ship.

far as practised in the training ship as well as in other matters down to the time of his leaving the ship.

19. No period of service on board a training ship will be allowed to count for more than one year's sea service, nor can it be accepted as equivalent to service in square-rigged vessels.

Service in Auxiliary Screw Whaling Ships and other Vessels with auxiliary steam power, which use their screws only in calms or during light winds, is considered as service performed in Sailing Vessels. Such service is not to be accepted in cases where service on board Foreign-going Steam-ships is required.

Service in Trawlers, Yachts, &c., alone will not qualify a Candidate for examination for a Foreign-going Certificate. He must show that he has served, in addition thereto, 18 months in an ordinary trading vessel.

Service in capacities other than as Apprentice or Seaman. Candidates whose services have been in capacities other than Apprentice, Ordinary Seaman, or Able Seaman, e.g., Cook, Steward, Carpenter, &c., will be required to satisfy the Port Officer that they have a good knowledge of Seamanship. This may possibly be proved by the production of satisfactory Certificates from Masters with whom the Applicants have served. Failing satisfactory evidence, the Applicant may be required to perform additional service, which must be in the capacity of Ordinary Seaman or Able Seaman.

Service on rivers and in smooth-waters. Loss of sight. Service performed on rivers, no matter of what size, or in smooth-water or partially smooth-water cannot be accepted.

24. A person who has lost the sight of one eye cannot be allowed to be examined for a Certificate of Competency. If he already holds a Certificate, he will not be allowed to be examined for a Certificate of a higher grade.

Service in Light Ships and Engine-room. Service in Light Ships or in an Engine-room will not be accepted as sea service for a Master's or Mate's Certificate of Competency.

26. In the case of service on board Excursion Steamers only such service as has been performed actually at sea can be accepted.

27. A First Class Pilot, with one year's Sea Service since he obtained his Pilot's Certificate, may be examined for a First Mate's Certificate for Foreign-going Ships. A Hooghly Master Pilot is for the purpose of this rule to be considered a First Class Pilot.

Services as Pilot's Apprentice. 28. Half the amount of service performed as an Apprentice in a Pilot Vessel propelled by sails may count as actual Sea Service to qualify for examination for a Certificate of Competency.

Desertion and gross misconduct. 29. Candidates who have neglected to join their vessels after having signed Articles, or who have deserted their vessels after having joined, or who have been found guilty of gross misconduct on board, will be required to produce satisfactory proofs of two years' subsequent service and good conduct at sea, unless the Local Government after having investigated the matter should see fit to reduce the time.

If after passing examination services are found to have been insufficient. 30. If after a Candidate has passed his Examination it is discovered on further investigation, e.g., by verification on the part of the Port Officer, that his services are insufficient to entitle him to receive a Certificate of the grade for which he has passed, it will not be granted to him; but if the Government is satisfied that the error in the calculation of his services did not occur through any fault or wilful misrepresentation on his part, he will be allowed to go up for re-examination without payment of further fee when he has performed the amount of service in which he was deficient.

Certificate of a lower grade may be granted in certain conditions. 31. If, in such a case, the applicant's services are sufficient to entitle him to receive a Certificate of a lower grade, provided as aforesaid he has not wilfully misrepresented the amount of his services, an Inferior Certificate may be granted to him, and the difference, if any, between the fee paid by him for the Superior Certificate and the fee payable for the Inferior Certificate, may be placed to his credit.

Must be re-examined for certificate of higher grade. 32. In such a case when the applicant has by further service made up the amount in which he was found to be short, he must, before he can receive the higher Certificate, be re-examined in all the subjects.

**Colour Tests.**

33. The Government have made the following arrangements for the Examination of persons as to their ability to distinguish Colours :—

34. Examinations in Colour are open to any person serving or about to serve in the Mercantile Marine.

35. Any person, including the holders of Certificate of Competency, or persons about to apply for Certificates of Competency, if desirous of being examined *in colours only*, must make application to the Port Officer on Form Exn. 2<sup>a</sup>, and pay a fee of one rupee.

36. He must on the appointed day attend for examination at the Examiner's Office ; and if he passes he will receive a Certificate to that effect.

37. If he fails it will be open to him to be examined again in Colours as often as he pleases on payment of the fee of one rupee at each fresh attempt.

38. The application of a Candidate who is presenting himself for Examination for a Master's or Mate's Certificate must be made on Form Exn. 2.—Such examination will commence with the Colour test; and if the Candidate does not, at the time of making application, hold a Certificate of Competency of any grade, and should fail to distinguish correctly any one of the colours used in the test, he will not be allowed to proceed with the examination in Navigation and Seamanship.

39. The fee he has paid for Examination for a Certificate of Competency will include the fee for the Colour test, and, with the exception of one rupee, will, in such event, be returned to him.

40. A Candidate for Examination for a Certificate of Competency who, at the time of making application, does not possess a Certificate, and who fails to pass the colour test, may not be re-examined until after the lapse of three months from the date of his first failure. If he fails a second time, he will be allowed a third trial at the expiration of another three months from the date of his second failure. A fresh fee must be paid at each succeeding examination.

41. It is therefore obviously to the advantage of Candidates for Certificates of Competency to apply in the first instance to be examined in *Colours only* on Form 2<sup>a</sup>.

42. A Candidate who holds a Certificate of Competency, and who, on presenting himself for Examination for a Certificate of a higher grade, is unable to pass the Colour test, will notwithstanding be permitted to proceed with the Examination in Navigation and Seamanship for the Certificate of the higher grade.

43. Should he pass this Examination the following statement will be written on the face of the higher Certificate which may be granted to him, viz.: "This officer has failed to pass the 'Examination in Colours.'"

44. Should he ultimately fail to pass the Examination in Navigation and Seamanship a like statement, relating to his being Colour blind, will be made by the Port Officer on his existing Certificate before it is returned to him.

45. Holders of Certificates which bear the statement of their having failed to pass in Colours, and who may desire to have the statement removed from their Certificates, must obtain the special permission of the Government.

**Qualifications for Certificates of Competency for a  
"Foreign-going Ship."**

*Foreign-going  
Sailing Ships.*

46. EXAMINATION IN COLOURS.—All Candidates for Certificates of Competency must first be examined in colours.\*

47. A SECOND MATE must be not less than seventeen years of age, and must have been four years at sea. He must also prove that he has served at least one year in a square-rigged sailing vessel within the last five years. See also para. 11.

On and after the 1st April 1890, no Candidate will be allowed to be examined unless he has served at sea two years

\* See Appendix L.

within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the Candidate is allowed to be examined.

48. IN NAVIGATION, &c.—He must write a legible hand, and will be required to give in writing, *vide supplementary vivæ voce* test, page 37, definitions of various astronomical and other terms used in navigation.\* He must have a competent knowledge of the first five rules of arithmetic, and the use of logarithms. He must be able to work a day's work complete, correcting the courses for deviation, leeway, and variation. He will be required to find the latitude by meridian altitude of the sun, and the difference of longitude from a given departure by parallel sailing; also to find the course and distance from one position to another by Mercator's method. He will be required to find the time of high water at a given port, to observe and calculate the amplitude of the sun, and to find the error of the ship's compass therefrom, and also the deviation, the variation being given. He must be able to find the daily rate of the chronometer from error observed, and to find the longitude from altitude of the sun by the usual methods. He must understand the use of the sextant, with its adjustments, and be able to observe with it, find the index error by the horizon, and *read off* and *on the arc*.† He must also pass a satisfactory examination in the International Code of Signals.‡

49. IN SEAMANSHIP, &c.—He must give satisfactory answers as to the standing and running rigging of ships; as to bending, unbending, setting, reefing, taking in and furling sail; as to sending masts and yards up and down, &c., &c.; as to the management of a ship when under canvas; of a ship's boat in heavy weather, and as to dunnaging and stowing cargo, &c. He must have a thorough knowledge of the rule of the road as regards both steamers and sailing vessels, their regulation lights, and fog, and sound signals,§ and be able to describe the signals of distress, and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals || He must be able to mark and use the lead and log lines. He must also understand the use and management of the rocket apparatus in the event of his vessel being stranded, and other questions of a like nature appertaining to the duties of the Second Mate of a ship, which the Examiners may think necessary to put to him. He will also be required to give satisfactory answers as to his knowledge of the additional subjects (applying more particularly to steam-ships) which are specified in the Rules of Examination for Second Mates' Certificates of Competency for Foreign-going Steam-ships.

50. AN ONLY AND FIRST MATE.—An Only Mate and a First Mate must be not less than nineteen years of age, and must have served five years at sea, of which in the case of a First Mate, one year must have been as Second or Only Mate. See also paras. 11, 16 and 27.

On and after the 1st April 1890, no Candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

Only and First  
Mate. A Candidate for an Ordinary Certificate of *any* grade, who does not already hold an Ordinary Certificate of a lower grade, must prove that he has served 12 months in a square-rigged sailing vessel within the last five years.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the Candidate is allowed to be examined.

51. IN NAVIGATION.—In addition to the qualifications required for a Second Mate, an Only and First Mate must be

\* See Appendix A.

† See Appendix B.

‡ See Appendix C.

§ See Appendix D.

|| See Appendix E.

able to find the true bearing of the sun and the error of the ship's compass from an observed azimuth of the sun, both from an altitude and also from the "Time Azimuth Tables," and with the variation given compute the deviation; to find the latitude from a single altitude of the sun off the meridian, and be able to use and adjust the sextant,\* and to find the index error by the sun; also to ascertain the true bearing of the sun, &c., and the ship's position by Sumner's Method by Projection.† He must also be conversant with the use of Mercator's Chart, and be able to find, on either a "true" or "magnetic" chart,‡ the course to steer and the distance from one given position to another; and find the ship's position on the chart from cross bearings of two objects; from two bearings of the same object, the course and distance run between taking the bearings being given; and the distance of ship from the object at the time of taking the second bearing. He must also understand how to keep a ship's Log Book. He will also be required to answer certain questions in writing (*and orally*) relative to cyclones or revolving storms.§

52. IN SEAMANSHIP, &c.—In addition to the qualifications required for a Second Mate, a more extensive knowledge of seamanship will be required, as to shifting large spars, rigging sheers, taking lower masts in and out, how to moor and unmoor ship, and to keep a clear anchor; to carry out an anchor; how to manage a ship in stormy weather; how to cast a ship on a lee shore; how to secure the masts in the event of accident to the bowsprit; and how to rig purchases for getting heavy weights, anchors, machinery, &c., in and out. He must give satisfactory answers as to the ventilation of holds and the stowage of explosives. He must also know how to rig a sea anchor, and what means to apply to keep a vessel disabled or unmanageable out of the trough of the sea, and lessen her lee drift; how to get a cast of deep sea lead in heavy weather; and answer any other questions appertaining to the duties of an Only and First Mate of a ship which the Examiners may think necessary to put to him. He will also be required to give satisfactory answers as to his knowledge of the additional subjects (applying more particularly to steam-ships) which are specified in the Rules of Examination for Only and First Mate's Certificates of Competency for Foreign-going Steam-ships.

53. A MASTER must be twenty-one years of age, and *Master*. have been six years at sea, of which one year must have been as First or Only Mate in a Foreign-going Ship, and one year as Second or Only Mate; or he must have been six and-a-half years at sea, of which two and-a-half years must have been as Second Mate of a Foreign-going Ship, during the last twelve months of which service as Second Mate he must have been in possession of a First Mate's Certificate. *Vide also paras. 11, 12 and 17.*

On and after the 1st June 1889, no Candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

A Candidate for an Ordinary Certificate of any grade, who does not already hold an Ordinary Certificate of a lower grade, must prove that he has served 12 months in a square-rigged sailing vessel within the last five years.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the Candidate is allowed to be examined.

54. IN NAVIGATION.—In addition to the qualifications required for a Second, Only, and First Mate, a Master must be able to compute the latitude from the meridian altitude of a star, &c. He must be able to find the magnetic bearing from

\* See Appendix B.

† See Appendix I.

‡ See Appendix F. The terms "true" and "magnetic" are used throughout the Regulations for the sake of brevity and convenience for indicating charts that have compasses engraved upon them showing the "true" or "magnetic" points of the compass respectively.

§ See Appendix K.

equidistant compass bearings of any fixed object when at sea, and compute the deviation therefrom. He must construct a deviation curve upon a " Napier's " diagram, which will be furnished by the Examiner, and understand the practical application of the same, and give satisfactory written (*and oral*) answers to certain practical questions on the effect of the ship's iron upon the compasses, the method of determining the deviation, and compensating same by magnets and soft iron.\* He will be required to find the course to steer by compass in order to counteract the effect of a given current, and find the distance the ship will make good towards a given point in a certain time and to work out practically the correction to apply to soundings taken at a given time and place to compare with the depth marked on the chart.†

55. IN SEAMANSHIP, &c.—In addition to the qualifications required of a Second, Only, and First Mate, he must be able to construct jury rudders for both wooden and iron vessels, and also rafts. He will be examined as to his resources for the preservation of the ship's crew in the event of wreck; as to the management of ships in heavy weather; as to rescuing the crew of a disabled ship; as to steps to be taken when a ship is on her beam ends, or in any danger or difficulty; or if disabled or unmanageable and on a lee shore; heaving a keel out, &c. He must explain the mode of procedure when placing ship in dry dock, directing repairs, and if putting in to port in distress with damage to cargo and ship. He must possess a sufficient knowledge of what he is required to do by law, as to entry and discharge, and the management of his crew, and as to penalties, and entries to be made in the official log, and a knowledge of the measures for preventing and checking the outbreak of scurvy on board ship, and the law as to load line marks, and the entries and reports to be made respecting them. He will be questioned as to his knowledge of invoices, charter party, bills of-lading, Lloyd's agent, and as to the nature of bottomry, also bills-of-exchange, surveys, averages, &c., and must answer any other questions of a like nature appertaining to the management of a ship which the Examiners may consider it necessary to touch upon. He will also be required to give satisfactory answers as to his knowledge of the additional subjects (applying more particularly to steam-ships) which are specified in the Rules of Examination for Masters' Certificates of Competency for Foreign going Steam-ships.

*For Fore and Aft  
rigged ships.*

**Certificates for Fore and Aft rigged Vessels.**

56. Certificates for the grades of Master, First Mate, Only Mate, and Second Mate, on which the words "for Fore and Aft rigged vessels only" will be written, will be issued to Candidates who have not complied with the regulation which requires them to have served at least one year in square-rigged sailing vessels, or who prove in course of examination that they are ignorant of the management of square-rigged ships.

57. A certificate "for Fore and Aft rigged vessels only" will not entitle the possessor to act in a capacity for which a certificate is required in square-rigged vessels, amongst which are classed full-rigged ships, barques, brig, barquentines, brigantines, and steam-ships carrying square sails.

58. A Candidate possessing a certificate "for Fore and Aft rigged vessels only," and desiring to obtain an ordinary certificate of the same grade, must prove that he has served at sea at least one year in a square-rigged sailing vessel, and will be re-examined both in navigation and seamanship.

*Foreign-going  
Steam-Ships.*

**Qualifications for Certificates of Competency for Foreign-going Steam-ships only.**

59. Certificates of Competency will be issued, subject to the examinations hereinafter described, for officers who have served in steam-ships, and who, owing to absence of service in square-rigged sailing ships, cannot under the

\* See Appendices G and M.  
† See Appendix F.

existing regulations obtain Certificates of Competency to act in the capacity of Masters or Mates of square-rigged ships.

60. These certificates will entitle the holders to go to sea as Masters and Mates of foreign-going steam-ships, but will not entitle the holders to go to sea as Masters or Mates of foreign-going sailing ships.

61. There will be no distinction in respect of "Fore and Aft" and "Square-rigged" steam-ships.

62. EXAMINATION IN COLOURS.—All Candidates for Certificates of Competency must pass the examination in Colours.

63. A SECOND MATE must be not less than seventeen years of age, and must have been four years at sea. See also para. 11.

On and after the 1st April 1890, no candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.

64. IN NAVIGATION, &c.—He must write a legible hand, and will be required to give in writing (*vide supplementary vivā voce test, page 39*) definitions of various astronomical and other terms used in navigation.\* He must have a competent knowledge of the first five rules of arithmetic, and the use of logarithms. He must be able to work a day's work complete, correcting the courses for deviation, leeway, and variation. He will be required to find the latitude by meridian altitude of the sun, and the difference of longitude from a given departure by a parallel sailing; also to find the course and distance from one position to another by Mercator's method. He will be required to find the time of high water at a given port, to observe and calculate the amplitude of the sun, and to find the error of the ship's compass therefrom, and also the deviation, the variation being given. He must be able to find the daily rate of the chronometer from error observed, and to find the longitude from altitude of the sun by the usual methods. He must understand the use of the sextant with its adjustments, and be able to observe with it, find the index error by the horizon, and read *off* and *on* the arc.† He must also pass a satisfactory examination in the International Code of Signals.‡

65. IN SEAMANSHIP, &c.—He must give satisfactory answers as to the standing and running rigging of steam-ships; as to bending, unbending, setting, reefing, taking in and furling sail; as to sending masts and yards up and down, &c., &c., as to seeing everything in readiness and clear for getting under way, and as to the precautions to be then observed with regard to engines, propellers, &c.; as to the management of a steam-ship when under canvas; and of a ship's boat in heavy weather, and as to dunnaging and stowing cargo, &c. He must have a thorough knowledge of the rule of the road as regards both steamers and sailing vessels, their regulation lights, and fog, and sound signals,§ and be able to describe the signals of distress and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals.|| He must be able to mark and use the lead and log lines. He must also understand the construction, use, and action of the sluices, and of the water-ballast tanks, engine-room, telegraph, &c.; the use and management of the rocket apparatus in the event of his vessel being stranded, and other questions of a like nature, appertaining to the duties of the Second Mate of a steam-ship, which the Examiners may think necessary to put to him.

66. AN ONLY AND FIRST MATE.—An Only Mate must be not less than nineteen years of age, and must have served five years at sea. A First Mate must be nineteen years of age, and must have served five years at sea, of which

\* See Appendix A.      † See Appendix B.      ‡ See Appendix C.  
§ See Appendix D.      || See Appendix E.

one year must have been as Second or Only Mate of a Foreign-going Steam-ship. *See also paras. 11, 16 and 27.*

On and after the 1st April 1890, no candidate will be allowed to be examined unless he has served at sea two years within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.

67. **IN NAVIGATION.**—In addition to the qualifications required for a Second Mate, an Only or First Mate must be able to find the true bearing of the sun and the error of the ship's compass from an observed azimuth of the sun both from an altitude and also from the "Time Azimuth Tables," and with the variation given compute the deviation; to find the latitude from a single altitude of the sun off the meridian, and to be able to use and adjust the sextant,\* and to find the index error by the sun; and also to ascertain the true bearing of the sun, &c., and the ship's position by Sumner's Method by Projection.† He must also be conversant with the use of Mercator's Chart, and be able to find on either a "true" or "magnetic" chart,‡ the course to steer and the distance from one given position to another; and find the ship's position on the chart from cross bearings of two objects; from two bearings of the same object, the course and distance run between taking the bearings being given; and the distance of ship from the object at the time of taking the second bearing. He must also understand how to keep a ship's Log Book. He will also be required to answer certain questions in writing (*and orally*) relating to cyclones or revolving storms.

68. **IN SEAMANSHIP.**—In addition to the qualifications required for a Second Mate, a more extensive knowledge of seamanship will be required, as to shifting large spars, rigging sheers, taking lower masts in and out, how to moor and unmoor ship and to keep a clear anchor, to carry out an anchor; how to manage a steam-ship in stormy weather, and how to rig purchases for getting heavy weights, anchors, machinery, &c., in and out. He must give satisfactory answers as to the ventilation of holds, and the stowage of explosives. He must be able to describe the effects of the screw race upon the rudder; and the effect produced on the direction of the head of the ship by going [ahead] [astern] with a [right] [left] handed screw when the rudder is [ported] [starboarded]. He must also know how to rig a sea anchor, and what means to apply to keep a steamer with machinery disabled out of the trough of the sea, and lessen her lee drift. How to turn a steam-ship short round; how to get cast of deep sea lead in heavy weather, and other questions of a like nature appertaining to the duties of an Only and First Mate of a steam-ship, which the Examiners may think necessary to put to him.

Master.

69. **A MASTER**—Must be not less than twenty-one years of age, and have been six years at sea, of which one year must have been as First or Only Mate in a Foreign-going Steam-ship, and one year as Second or Only Mate; or he must have been six and-a-half years at sea, of which two and-a-half years must have been as Second or Only Mate in a Foreign-going Steam-ship, during the last twelve months of which he must have been in possession of a First Mate's Certificate. *See also paras. 11, 12 and 17.*

On and after the 1st April 1890, no candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.

70. **IN NAVIGATION.**—In addition to the qualification required for a Second, Only, and First Mate, he must be able

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\* See Appendix B.    † See Appendix I.    ‡ See Appendix F.  
Also page 24 foot-note ‡.

to compute the latitude from the meridian altitude of a star, he must be able to find the magnetic bearing from equidistant compass bearings of any fixed object when at sea, and compute the deviation therefrom. He must construct a deviation curve upon a "Napier's" diagram which will be furnished by the Examiner, and understand the practical application of the same, and give satisfactory written (*and oral*) answers to certain practical questions on the effect of the ship's iron upon the compasses, the method of determining the deviation, and compensating same by magnets and soft iron.\* He will be required to find the course to steer by compass in order to counteract the effect of a given current, and find the distance the ship will make good towards a given point in a certain time, and to work out practically the correction to apply to soundings taken at a given time and place, to compare with the depth marked on the chart.†

**71. IN SEAMANSHIP, &c.**—In addition to the qualifications required of a Second, Only, and First Mate, he must be able to construct rafts and jury rudders suitable for a screw steam-ship. He will be examined as to his resources for the preservation of the ship's crew in the event of wreck; as to the management of steam-ships in heavy weather; as to rescuing the crew of a disabled ship; as to steps to be taken when a ship is on her beam ends; or if disabled and on a lee shore. How to use steam appliances in the event of fire, and the best arrangement for towing vessels under different circumstances, placing ship in dry dock, directing repairs, and the mode of procedure if putting into port in distress with damage to cargo and ship. He must possess a sufficient knowledge of what he is required to do by law, as to entry and discharge, and the management of his crew, and as to penalties and entries to be made in the official log, and a knowledge of the measures for preventing and checking the outbreak of scurvy on board ship, and the law as to load line marks, and the entries and reports to be made respecting them. He will be questioned as to his knowledge of invoicees, charter-party, bills-of-lading, Lloyd's agent, and as to the nature of bottomry; also bills-of-exchange, surveys, averages, &c., and answer any other questions of a like nature, appertaining to the management of a steam-ship, which the Examiners may consider it necessary to touch upon.

#### Service in Royal Navy.

**72. Officers of the Royal Navy** are at liberty to apply for *Service in Royal Navy*. Certificates of service and to be examined for Certificates of Competency in the Mercantile Marine, but they must submit their applications in the manner directed by the Lords Commissioners of the Admiralty.

73. Officers of the Royal Navy desirous of being examined for Certificates of Competency in the Mercantile Marine will be required to prove the following service, of which twelve months must have been sea service under sail alone.

74. For Second Mate.—A Candidate must produce satisfactory evidence of four years' service at sea, or that he has attained the rank of acting Sub-Lieutenant.

75. For Only Mate.—A Candidate must prove five years' service at sea.

76. For First Mate or Masters.—A Candidate must show that he has attained the rank of Sub-Lieutenant, or Navigating Sub-Lieutenant.

#### Voluntary Examination in the Laws of the Deviation of the Compasses of Iron Ships.

77. Any Master or Mate who wishes to pass a voluntary examination in the Syllabus\* of examination on the Laws of the Deviation of the Compasses of an Iron Ship, &c., can at any time be examined upon filling up the form of application, and the payment to the Port Officer of the prescribed fee. If the candidate passes the examination successfully, an endorsement to that effect will be duly made upon the Master's or Mate's Certificate held by him.

*Voluntary Examination of  
Masters and  
Mates in the Syllabus.*

\* See Appendix G and M.    † See Appendix F.    ‡ See Appendix A.

**Failure.**Re-examination  
in case of failure

78. In all cases of failure the Candidate must be examined *de novo*. If a Candidate fails in *Seamanship* he will not be re-examined until after a lapse of SIX MONTHS. Whether the whole or part of this period must be served at sea must depend upon the subjects in *Seamanship* in which the Candidate failed, but what amount (if any) of sea service will be required will be left to the discretion of the Port Officer, subject, however, to revision by the Government, should they see fit.

79. The Examiners in making out their report on Form Exn. 14 should state what amount (if any) of further sea service the Candidate must perform, and they should also insert this information under Division H. in Form Exn. 2.\*

80. If he fails three times in *Navigation* he will not be re-examined until after a lapse of THREE MONTHS from the date of the *last failure*.

Certificate of  
lower grade.

81. If a Candidate has failed in his Examination, but the subjects in which he has failed are not included in the subjects required for a Certificate of a lower grade, he may, if he desires it, receive a Certificate of such lower grade.

82. No part, however, of the fee he has paid will be returned to him, and on presenting himself, when entitled, for re-examination for the higher grade of Certificate he will be required to pay a further full fee.

83. If a Candidate fails for bad spelling or writing, he will not be re-examined until after a lapse of at least three months.

84. If a Candidate fails in his examination for an ordinary Certificate, he may, if qualified, and upon payment of another fee, &c., be examined for a Certificate of Competency for Foreign-going Steam-ships without waiting the usual time after failure.

**Fees.**Fees to be paid  
by applicants for  
examination,  
§. 133.

85. Candidates for examination, in making their application on Form Exn. 2, will be required to pay the examination fee before any step is taken, whether by enquiring into their services or testing their qualifications, &c. Should it be found that their service is not sufficient to entitle them to be examined, or should their testimonials be unsatisfactory, or should they from any other cause, except failure to pass the colour tests, not be examined, no part of the fee will be returned to them, but when they have fulfilled the requisite service, or are able to produce satisfactory testimonials, as the case may be, they will be allowed to again present themselves for examination for a Certificate of the same grade without paying any further fee.

86. The fee for examination must be paid to the Port Officer. In any case in which a Candidate offers money to any other officer, and in any place but in the Port office, the Candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be again examined for twelve months.

87. If a Candidate fail in his examination *no part of the fee will be returned to him*.

88. The fees are as follow:—

**FOR "FOREIGN-GOING SAILING AND STEAM SHIPS."**

	Rs.
Second Mate ... ...	12
First and Only Mate, if previously possessing an inferior certificate, either granted by the Board of Trade, or by the Government of a British Possession <i>under section 8 of the</i> <i>"Merchant Shipping (Colonial) Act, 1869"</i>	6
If not ... ...	12
Master ... ...	24
Where a Candidate is in possession of a Certi- ficate for Fore and Aft rigged Vessels, for an Ordinary or Steam-ship Certificate of the same grade ... ...	12

\* See Appendix H.

## FOR "VOLUNTARY EXAMINATION IN STEAM."

	Rs.
Mate (Only or First) ... ...	12
Master ... ...	12

FOR "VOLUNTARY EXAMINATION IN DEVIATION OF  
THE COMPASS."

	Rs.
Mate (Second, Only or First) ... ...	12
Master ... ...	12

## GENERAL.

89. Certificates of Competency shall be made and issued by the Government in the forms hereunto annexed.

90. Every Certificate of Competency shall be made in duplicate, and one copy shall be delivered to the person entitled to the Certificate and the other shall be kept and recorded by the Port Officer of Calcutta.

90A. No application from the holder of a certificate granted by the Government of any other British Possession or by the Board of Trade to be examined for a certificate of the same legal value shall be entertained.

## General Instructions to Examiners and Candidates.

91. All instruments necessary for use in the examinations are supplied by the Government. Prohibited books and papers.

92. Before commencing the examination, the tables or desks must be cleared of all scraps of paper, or books that are not used in the examination, and care should be taken that the candidates do not bring into the examination room any book, paper, document, or memoranda of any description whatever. No person whatever should be allowed in the room during the time of examination, but those whose duties require them to be present.

93. No instructors will be allowed on the premises.

94. Candidates will under no pretence whatever be allowed to leave the premises while the examination is proceeding. If a Candidate has occasion to visit the retiring room he will only be allowed to do so on the completion of the paper on which he may be engaged, when he will be required to enter in a book, kept for the purpose, the exact time of his leaving and returning to the examination room. When only a few Candidates are under examination, two persons will not be allowed to leave the room at the same time.

95. Candidates should be so placed as to prevent one copying from the other, and no communication whatever between the Candidates should be allowed. Position of Candidates at examination.

96. If any blotting paper is allowed it should be black; Blotting paper. and when the first examination paper is issued each Candidate should be furnished with a piece which should be returned to the Examiner upon the completion of the last paper.

97. The examination papers should be issued to the Candidates in half sheets only, and one at a time. This will prevent a Candidate from spreading out the sheets on the table in an apparently careless manner, but so as to enable his nearest neighbour to look over and copy, or examine the problems. It will also enable the Examiner to look over and report upon the work on one half sheet, while the Candidate is at work upon another, and so on. When the errors are not too numerous, or when they are not from ignorance of the subject, the incorrect problems may be returned to the Candidate for correction, but in no case should the errors be pointed out by the Examiner, neither should any marks be made on the correct work of the problem, which would at once indicate how far or to what extent the work is correct. Should the problems be returned to the Examiner the second time incorrect, this would be a failure; and as the time allowed is considered ample for working out the papers carefully, this rule is expected to be strictly observed.

98. When from the large number of the Candidates, it may be found impossible to look over the work, on the day of examination during the office hours, an hour in the morning of the following day may be allotted for the purpose of correcting the problems, but in no case should a Candidate have his problem returned to him for correction after he has made the second attempt. In certain cases problems may be corrected on morning following examination day.

## Re. Exn 4A

99. The paper (Exn. 4A) is only for those Candidates who present themselves for examination for the first time. It is intended not only to ensure on the part of the Candidate a knowledge of the meaning of a variety of terms of great use to the Navigator respecting which much ignorance exists at present, but at the same time to test his handwriting and spelling.

100. In using this paper, the Examiner will place a mark against the numbers of the particular questions which he selects for answers, and not less than ten questions should be selected. The Candidate will then write against the questions so marked his definition of the terms in a clear and legible hand, so as to prevent the possibility of any letter being mistaken. Attention should be paid to the spelling and writing of all grades of Candidates. The *supplementary viva voce* test should also be applied as usual.

Re-questions  
on Deviation of  
the Compass.  
(Exn. 7,  
Appendix G.)

101. In the questions on Deviation of the Compass (Exn. 7, Appendix G) the Examiner should indicate by a mark against at least twelve of the questions for answers, and those indicated must be correctly answered. The selected questions should be varied frequently, and no two Candidates should have precisely the same questions. The Candidate should be furnished with sheets of blank ruled paper which is supplied for that purpose with instructions that he is to write only on one side of the paper, and to answer each of the questions against which a mark is placed in a clear and legible hand, and to commence each answer by writing down the number of the question to which it relates in the margin left for that purpose. In answering question 19, besides giving a full explanation in writing, of the *tentative* method\* of compass adjustment (accompanying the usual *supplementary viva voce* test), the Candidates should be required to illustrate by diagrams how the poles of the magnets are placed with regard to the compass needle for correcting the semi-circular deviation, as well as the heeling error, and also how the soft iron should be placed for correcting the quadrantal deviation, or the Candidate may be tested by "Beali's Compass Deviascope," in which case it will not be necessary for him to give the written answer and sketches.

Viva voce  
examination.

102. In the *viva voce* examination a reasonable time should be allowed for the Candidate to give his answers. No assistance should be given or leading question put.

Adjustment of  
sextant.

103. Particular attention should be paid to the adjustments of the sextant, and the written answers should be given on the ruled paper in the same manner as the answers to the questions on Exn. 7, and the *supplementary viva voce* test applied as usual. Every Candidate should have a practical knowledge of what is known as the first three adjustments, and be able to read correctly *off* the arc, a supposed index error to be given by the Examiner as additive, as well as reading *on* the arc in the usual way.

Minor correc-  
tions.

104. All outstanding or minor corrections should appear in the margin of each problem paper; also on the chart papers Exn. 9C and Exn. 9D; and unless all these corrections appear on the papers of the Candidate they will not be considered complete.

Examination  
to commence  
with that for  
Second Mate.

105. In every case the Examination, whether for Only Mate, First Mate, or Master, is to commence with the problems for Second Mate.

Problems re-  
quired as tests.

106. Examiners should bear in mind that the problems to be performed are required as tests, and for the purposes of an Examination and not for sea-going or practical purposes alone.

107. The Candidates will be allowed to work out the various problems according to the method and the tables they have been accustomed to use.

Time allowed  
for working  
problems.

Time allowed for Problems and Writings.

108. Candidates for Second Mates' Certificates of Competency must complete the whole of their Examination in Navigation in *eight hours*, including the time allowed for writing the definitions (Exn. 4A), the paper on the adjustment of the sextant, and the correction of *all* errors and oversights; but

\* See Appendix M.

the nautical problems on Forms "Exn. 4" and "Exn. 5" must be completed within *six hours*, and without the Candidates leaving the premises during that period.

109. *Candidates for Only and First Mates' Certificates* must complete the whole of their examination in Navigation in *twelve and-a-half hours*,\* including the time allowed for the papers on the sextant; the chart; cyclones or revolving storms; and for the correction of *all* errors and oversights; but the nautical problems on Forms "Exn. 4," "Exn. 5," and "Exn. 6" must be completed within *six hours*, and without the Candidates leaving the premises during that period.

110. *Candidates for Certificates as Masters, Ordinary*, must complete the whole of their examination in Navigation in *fifteen hours*; including the time allowed for the papers on the sextant; the chart; compass deviation; cyclones or revolving storms; and for the correction of *all* errors and oversights; but the problems on Forms "Exn. 4," "Exn. 5," and "Exn. 6," must be completed within *six hours*, and without the Candidates leaving the premises during that period.

111. *Candidates after finishing the problems required of the respective grades* on the first day of examination should proceed, until the end of that day, with such subjects as the definitions, sextant, chart, and Question 19 of Form "Exn. 7."

112. *The Sumner Problem (Exn. 6a)* must on no account be given out to any of the grades on the first day of the examination, but should be the commencement of the Candidate's work on the second day, and on completion of this problem the Candidates for Masters' Certificates should proceed with the problems on paper "Exn. 7."

113. *Candidates for Foreign-going Steam-ship Certificates of Competency* will be allowed the same amount of time to perform their navigation, &c., as hereinbefore laid down for the respective grades for the Ordinary Foreign-going Certificates.

114. *Deviation of the Compass*.—A period not exceeding eleven hours will be allowed to Candidates for the completion of the whole of the examination in the Syllabus, including the correction of all errors and oversights in both the problems and writings.

115. Punctually at the expiration of the prescribed time all the papers should be called up, whether completed or not, and if not completed, the Candidate will be declared to have failed, unless the Port Officer or the Examiner see fit to lengthen the period in any special case. If, however, the period is lengthened in any case, the special circumstances of that case, and the reasons for lengthening the period, together with the time allowed, must be reported to the Government by the Examiners, in the column for "remarks" on the Form Exn. 14. It should be noted that the periods prescribed in the foregoing paragraphs are not intended to include the time occupied by the *viva voce* part of the examination.

116. It is anticipated that but few of the Candidates for Certificates of Competency for any of the foregoing grades will require the whole of the time herein allowed for completing their Examination in Navigation; and ample time has been prescribed, so that Candidates may perform their work in a careful, clear, and legible manner, and to the entire satisfaction of the Examiners.

#### *Degree of Precision required in the Solution of the Problems.*

117. In order to prevent any misapprehension as to the degree of precision required by the Regulations in working out the various problems in the Examinations for Masters' and Mates' Certificates, the attention of Examiners and Candidates is particularly directed to the following Instructions:—

- (a.) Candidates are expected to work out their answers to all problems within or not to exceed a margin of *one mile of position* from a correct result (e.g., in problems where the answer required is a latitude, longitude, or distance), excepting in finding the

\* A Candidate other than Second Mate who may not previously have passed an examination may be allowed the time occupied in writing his definitions on Exn. 4a, in addition to the above.

ship's position by "Sumner's" method, where a margin of  $2\frac{1}{2}$  miles will be allowed.

- (b.) In such problems as the "Amplitude" and "Alt-Azimuth," where the bearings, deviations, &c., only are required, a margin of 2', or 3', from a correct result will be sufficiently accurate.
- (c.) In no problem is the Candidate for an "ordinary" Certificate required by the Regulations to correct for *second differences* in taking out the quantities from the Nautical Almanac.
- (d.) In solving the "Time Azimuth" problem, an answer not exceeding half a degree from the exact result will be sufficiently near. But in all cases the actual latitude, declination, and time used, together with the exact bearing (from the North or South) as given in the tables, must be clearly shown by the Candidate on his papers.
- (e.) In interpolating for the correct deviation to be applied in solving the Chart question, Papers "Exn. 9 C." and "Exn. 9 D," it will usually be sufficiently near if the Candidate works throughout with the nearest degree of deviation taken from the "Deviation Card," and even in cases where the deviations may vary but little, the nearest half degree used throughout will be sufficiently precise, and will at the same time prove whether the Candidate understands the method of arriving at the amount of, and applying, deviations. It is not necessary that the Candidate should waste his time in solving the course to *odd minutes* as is sometimes done.
- (f.) In calculating the correction to apply to the Soundings, Question 5 of Paper "Exn. 9 D," the Candidate is not required to work out to the exact inch, as is sometimes done. It will be sufficiently near if he brings his answer within half a foot or so of a precise result.

It must be clearly understood in reading the foregoing Instructions that it is always provided the work of the Candidate is correct in principle.

*Supplementary vivâ voce Examination on written Papers.*

118. An impression prevails in regard to the examination of Masters and Mates, that so long as a Candidate can commit to paper correct answers to the various questions requiring written answers (*e.g.*, *Forms Exn. 4a, Exn. 7, Exn. 9a, Exn. 9c, Exn. 32. 70, &c.*), no matter how indicative the answers may be of their having been learnt off by rote *only*, the duty and responsibility of the Examiners are at an end, and that they have no power or authority to reject a Candidate should his written answers be correct.

119. Lest, therefore, such an impression should prevail, Candidates for Certificates of Competency should bear in mind that they are not only expected to give correct written answers, which may merely be learnt off by rote, but they are expected to possess an intelligent knowledge of the various subjects prescribed in the Regulations, particularly as regards the important subject of the Deviation of the Compass.

120. This result may be easily attained by the Examiner putting a few *vivâ voce* questions to the Candidate as the papers are brought up for inspection, or at any subsequent time if more convenient. The oral questions (suggested by the printed questions and the answers given) should be such that the Examiner may satisfy himself that the candidate possesses a real knowledge of what he has written, and should be confined strictly to the subjects of the printed questions. Should the candidate then exhibit ignorance of the subjects, the Examiner (who is in a position to judge of the real knowledge the man before him possesses) should deal with him at his discretion, notwithstanding that the candidate may have written all the answers correctly by rote.

121. When an Examiner finds it necessary to fail a Candidate in this *supplementary vivâ voce* test, a memorandum containing the particulars of the points on which the candidate was ignorant, *i.e.*, *the identical questions and the identical*

*answers given*, must in each case be attached to his examination papers, when forwarded in the usual course to the Port Officer, or the particulars may be set forth by the Examiner in the margins of the candidate's papers in red ink.

122. If the Candidate passes, he will receive the Form Form Exn. 16 Exn. 16, upon which the Government, will issue the Certificate Completion of to the candidate, whose testimonials, &c., will be returned examination at the same time.

#### Special Notice to Candidates.

123. The attention of Candidates is specially called to the following Regulations :—

124. Candidates are required to appear at the examination-room punctually at the time appointed.

125. Candidates are prohibited from bringing into the examination-room books, paper, or memoranda of any kind whatever. The slightest infringement of this regulation will subject the offender to all the penalties of a failure, and he will not be allowed to present himself for re-examination for a period of three months.

126. In the event of any Candidate being detected in defacing, blotting, writing in, or otherwise injuring any book or books belonging to the Government, the papers of such Candidate will be detained until the book or books so defaced be replaced by him. He will not, however, be at liberty to remove the damaged book, which will still remain the property of the Government.

127. In the event of any Candidate being discovered referring to any book or memoranda, copying from another, or affording any assistance or giving any information to another, or communicating in any way with another, during the time of examination or copying any part of the problems for the purpose of taking out of the Examination rooms, he will subject himself to all the penalties of a failure, and he will not be allowed to be examined for a period of six months.

128. No Candidate will be allowed to work out his problems on a slate or on waste paper.

129. No Candidate will be permitted to leave the room until he has given up the paper on which he is engaged.

130. Candidates will find it more convenient both here and at sea, to correct the declination and other elements from the Nautical Almanac by the "hourly differences," which have been given in that work in order to facilitate such calculations ; they will thereby render themselves independent of any proportional or logarithmic table for such purpose.

131. The corrections by inspection from tables given in some of the works on Navigation will not be allowed (*see* Tables IX, XI and XXI in Norie's Epitome, &c.); every correction must appear on the papers of the Candidates.

132. Any candidate who may be guilty of insolence to the Examiner or of other misconduct will render himself liable to the postponement of his examination, or, if he has passed, to the detention of his Certificate for such period as the Government may direct.

133. For rules as to amount of time allowed to perform the work, *see* page 36.

#### Masters' and Mates' Voluntary Examinations in Steam.

134. These examinations are limited to Masters and First or Only Mates who are possessed of or entitled to Certificates of Competency, and are provided for the purpose of giving them an opportunity of undergoing a voluntary examination as to their practical knowledge of the use and working of the steam engine. They are conducted under the superintendence of the Port Officer at such times as they may appoint for the purpose ; and the Examiners are selected by the Government from the Engineer-Surveyors appointed under the Indian Steam Ships Act, 1884.

135. Any Master or Mate desiring to be examined in Steam must deliver to the Port Officer a statement in writing to that effect, upon the Form of Application (Exn. 2), and the applicant's Certificate of Competency must be delivered to the Port Officer along with his statement. If he is about to pass an examination for a Certificate of Competency at the same time, the applications should be sent in together.

136. A fee of Rs. 12 must be paid by the applicant for the examination in Steam, and the Port Officer will thereupon inform him of the time and place at which he is to attend to

*Voluntary  
Examinations  
in Steam.*

*Application,  
how to be  
made.  
Exn. 2.*

*Fee to be paid.  
Conduct of  
examination,  
&c.*

be examined, and the examination will then and there proceed in the same manner as the other examinations. If the applicant fails, and has given in his Certificate, it will be at once returned to him.

Record of  
Certificate.  
Exn. 14.

137. If the applicant passes, the Report (Exn. 14.) and the Certificate of Competency with the Form (Exn. 2.) will be sent to the Government; the words "*Passed in Steam,*" with the date and place of examination, will then be entered on the Certificate and its counterpart, and the Certificate will be sent to the Port Officer to be delivered to the applicant in the usual manner.

Failure.

138. If the applicant fails he may not present himself for re-examination until the expiration of three months from the date of failure.

Extent of  
examination.

139. The examination is for the most part *vivâ voce*, and extends to a general knowledge of the practical use and working of the steam engine, and of the various valves, fittings, and pieces of machinery connected with it. Intricate theoretical questions on calculations of horse power or areas of cylinders and valves, or any of the more difficult questions which appertain to steam engines and boilers, will not be asked. The examination will in fact be confined to what a Master of a steam-vessel may be called upon to perform in the case of the death, incapacity, or delinquency of the engineer.

Where exami-  
nation to be  
conducted

140. Examiners are to be careful in their examinations to satisfy themselves that applicants really do know the names and uses of the various parts of engines and boilers, and their connecting pipes, valves, cocks, &c. Practical knowledge, as distinguished from theories, abstruse calculations, and book learning, is to be the test of the applicant's fitness to have his Certificate indorsed.

Examination in  
elementary  
questions.

141. The Examiner should arrange to conduct part of the examination in the engine-room of a Steam-ship, unless from circumstances he finds it impossible to do so; and if an opportunity offer the applicant should be permitted, under the guidance of the Examiner, to start and stop the engine of some vessel which may have her steam up.

Answers to be  
sent to the  
Board of Trade.

142. The Examiner, in sending in his report of examinations of Masters and Mates in steam, should state where the examination has been held.

Candidates re-  
ferring to  
books, &c., to  
be put down  
as failed.

143. Candidates will be required to give written answers to sixteen out of twenty questions taken from a book of Elementary Questions published by the Government.\* These questions will be altered from time to time without notice. The twenty questions are not to be difficult, theoretical, or book questions, but are to be such as any man of ordinary capacity ought to answer who has any "*practical knowledge of the use and working of the steam-engine.*"

In cases of  
failure Ex-  
aminer to report  
questions that  
decided it.

144. These questions, with the Candidate's answers, should be sent to the Government, with the reports, after each examination.

Service on  
board Steam-  
Ship unne-  
cessary.

145. These answers will also assist in enabling the Government to decide any question that may hereafter arise in cases where it is alleged that applicants have been improperly passed, or improperly rejected.

146. The Examiners will be careful that if any Candidate refers to any book or paper or memorandum, or obtains information from another Candidate during the examination, he will be treated as having failed, will forfeit his fee, and will not be allowed to be re-examined for a period of three months.

147. The Examiners will report in the case of failure, the nature of the question or questions that decided the failure, or the point in the management of the engine in which the Candidate was deficient.

148. There is nothing in the Regulations requiring that applicants for the voluntary examination shall have served on board Steam-Ships; all that is required is that they shall have a "*practical knowledge.*" Examiners will, of course, not fail to appreciate the fact, when passing applicants, that practical knowledge is best gained in the engine-room; and the examination of an Officer who does not produce official evidence of service in Steam Ships, and of experience of engines, must necessarily be more searching than in the case of one who produces evidence of such service and experience.

## APPENDIX A.

N.B.—*The Candidate is to write a short definition against so many of the following terms as may be marked with a cross by the Examiner. The Examiner will not mark less than 10. The writing should be clear, and the spelling should not be disregarded.*

1. The Equator.	25. Right Ascension.
2. The Poles.	26. Dip or Depression of the Horizon.
3. A Meridian.	27. Refraction.
4. The Ecliptic.	28. Parallax.
5. The Tropics.	29. Semi-diameter.
6. Latitude.	30. Augmentation of Moon's Semi-diameter.
7. Parallels of Latitude.	31. Observed Altitude.
8. Longitude.	32. Apparent Altitude.
9. The Visible Horizon.	33. True Altitude.
10. The Sensible Horizon.	34. Zenith Distance.
11. The Rational Horizon.	35. Vertical Circles.
12. Artificial Horizon and its use.	36. Prime Vertical.
13. True Course of a Ship.	37. Civil Time.
14. Magnetic Course.	38. Astronomical Time.
15. Compass Course.	39. Sidereal Time.
16. Variation of the Compass.	40. Mean Time.
17. Deviation of the Compass.	41. Apparent Time.
18. The Error of the Compass.	42. Equation of Time.
19. Lee Way.	43. Hour Angle of a Celestial Object.
20. Meridian Altitude of a Celestial Object.	44. Complement of an Arc or Angle.
21. Azimuth.	45. Supplement of ditto.
22. Amplitude.	
23. Declination.	
24. Polar Distance.	

## APPENDIX B.

## ADJUSTMENTS OF THE SEXTANT.

The Applicant will answer in writing, on paper which will be given him by the Examiner, all the following questions, numbering his answers with the numbers corresponding to the questions :—

Question.

1. What is the first adjustment of the sextant ?
2. How do you make that adjustment ?
3. What is the second adjustment ?
4. Describe how you make that adjustment ?
5. What is the third adjustment ?
6. How would you make the third adjustment ?
7. In the absence of a screw how would you proceed ?
8. How would you find the index error by the horizon ?
9. How is it to be applied ?
10. Place the index at error of                  minutes to be added, clamp it, and leave it.

(NOTE.—The Examiner will see that it is correct).

11. The Examiner will then place the zero of the vernier on the arc, not near any of the marked divisions, and the Candidate will read it.

NOTE.—In all cases the applicants will name or otherwise point out the screws used in the various adjustments.

(The above completes the Examination of Second Mates.)

Candidates for Only Mates', First Mates', and Masters' Certificates will be required to give, in writing, replies to the following questions, *in addition* to those required of Candidates for Second Mates' Certificates as above.

1. How do you find the index error by the Sun ?
2. The readings being {                  } What is the Index Error, and how do you apply it ?
3. What proof have you that those measurements or angles have been taken with tolerable accuracy ?

## APPENDIX C.

## EXAMINATION OF MASTERS AND MATES IN THE INTERNATIONAL CODE OF SIGNALS.

## Instructions to Examiners.

The Government desire to direct the attention of the Examiners to the principal points connected with the International Code of Signals (which is to be treated as a subject in Navigation) as to which Candidates for Examination should be questioned in order to qualify for Certificates of Competency.

The Government would recommend to the Examiners a perusal of the *Report of the Signal Committee* of 1855 (which will be found at the commencement of the Signal Book), and also the *first few pages of the Book*. The information therein given will be found sufficient to make the Examiners theoretically acquainted with the characteristics of the Code, and the advantages it claims to possess over other Codes, and will enable them to appreciate and urge upon Candidates for Examination the facilities which this System of Signalling affords for easy and rapid communication.

The "comprehensiveness" and "distinctness" of the International Code are its chief recommendations.

The form of the Hoist generally indicates the nature of the Signal made, so that an observer can at sight understand the character of the Signal he sees flying.

The annexed plate gives examples which illustrate this.

The Examinations should tend to elicit a knowledge of the distinctive features of the Code above alluded to.

With this object the Examiners should make the 2, 3, and 4 Flag Signals on the Frame board which is furnished for the purpose (*always taking care first to show the Ensign and the Code Pennant at the Gaff*),\* questioning the Candidates as to the distinguishing Forms of the respective Hoists (*See Plate annexed*), which will be indicated according as a Burgee, or a Pennant, or a Square Flag, is uppermost.

The Candidate ought to know how to find in the Signal Book the communication or the inquiry he desires to make, and how to make the Signal. The Signal to be made should *invariably* be sought for by the Candidate in the Vocabulary and Index, Part II, and never in Part I.

The Candidate ought to know how to interpret a Signal.

The Examiner should place a Signal on the Frame board and vary the Signal by showing a 2 or 3 Flag Signal, or a "Geographical" or a "Vocabulary" Signal, or the name of a Merchant Ship or a Ship of War.

The two latter signals would not of course be found in the Signal Book. The Candidate ought to point them out in the *Code List of Ships*.

A Candidate ought to be able to read off a Signal at sight, so far as to name the Flags composing the Hoist.

He ought to know the use of the Code Pennant, and of the Pennants C. and D., "Yes" and "No."

The Candidate should be practised in the use of the Spelling Table, by being made to spell his own name, or some word not in the Vocabulary of the Code.

A knowledge of the Distant Signals should be required of the Candidate, their object and the mode of signalling by the Distant Code, which will be found at the end of the Signal Book.

For this purpose two Black Balls, two Black Square Flags, and two Black Pennants will be furnished with the Frame board, and the Candidate should be required to make one or two Distant Signals, and to read off one or two made by the Examiners.

The Ball being the distinguishing symbol of the Distant Signal, any Pennants or Flags of the Code may be employed in conjunction with it, irrespective of colour. The Black Pennants and Flags are merely sent as showing best in the light background of the Frame board.

The Examiners should be careful to ascertain that the Candidate possesses a knowledge of the Distress Signals which came into operation November 1st, 1873.

#### SEMAPHORES.

A plate at the end of the Signal Book explains the method by which the arms of the Semaphore are made to represent by their position (up, down, or horizontal,) the three symbols used for Distant Signalling, viz. a Flag, a Ball, or a Pennant. Before making Signals with the Semaphore, the Black Disc with the white rim should be placed on the top of the Semaphore Mast, as it properly forms a part of the Mast itself.

The International Code is used on board Her Majesty's Ships and it has been adopted by all the principal maritime powers for their Imperial as well as for their Mercantile Navies.

*Note.*—The International Code of Signals, with the Code List, is prepared by the Registrar-General of Shipping and Seamen, and may be had of the Publishers, Messrs. Spottiswoode & Co., 54, Gracechurch Street, London, and the principal Booksellers at the various ports.

The Official Mercantile Navy List and Maritime Directory published for the use of Merchants, Shipowners, Shipbrokers, and others, may be obtained in like manner, price 12s.

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\* The object of this is, of course, to distinguish the Signals from those of another Code.

## FLAGS OF THE INTERNATIONAL CODE OF SIGNALS.



N.B.—When used as the “Code Signal,” this Pennant is to be hoisted under the “Ensign;” when used as the “Answering Pennant,” where best seen.


The following examples will serve to illustrate how the form of a Hoist will usually denote the nature of the Signal made:—

ONE FLAG.	TWO FLAGS.		THREE FLAGS.		FOUR FLAGS.			
	BURGEE uppermost, “ATTENTION” Signals.	PENNANT uppermost, “COMPASS” Signals.	SQUARE FLAG uppermost, “URGENT” Signals.	General Signals.	BURGEE uppermost, GEOGRAPHICAL Signals.	PENNANTS C,D,F uppermost, NATIONAL VOCABULARY.	PENNANT G uppermost, NAMES OF MEN-OF-WAR.	SQUARE FLAG uppermost, NAMES OF MERCHANTSHIPS.
C “YES.”								
D “No.”								

W, BY S.      IN DISTRESS, WANT ASSISTANCE, WHAT SHIP IS THAT?

WHAT SHIPS HAVE “MARLBOROUGH” SCREW? YOU SPOKEN? FALMOUTH, CALL FOR ENGINE BROKEN DOWN, ORDERS OFF.

“MARCO POLO,” NO. 6026.

## APPENDIX D.

REGULATIONS respecting LIGHTS and FOG SIGNALS and  
STEERING and SAILING RULES ISSUED by the BOARD  
of TRADE.

## NOTICE.

The Board of Trade have had their attention drawn to the necessity of a more strict examination of applicants for Certificates of Competency in their knowledge of the regulations for preventing collisions at sea.

In order that the rule of the road at sea may be better understood, and that a uniform system of examination may prevail, the Board of Trade have issued the following catechism.

This catechism has received the approval of the Trinity House and Admiralty in England, and of the Council of the Admiralty of France.

The Board of Trade attach very great importance to a thorough knowledge of the steering and sailing rules on the part of every applicant for a Certificate of Competency, and a thorough examination on the part of the examiners.

All applicants for examination, whether for certificates as masters or mates, are to be examined as to their knowledge of the steering and sailing rules each time they present themselves for examination.

Questions suggested by the following heads of Examination are to be asked in addition to, and are not to supersede, any other questions proper and necessary to be asked by the Examiner.

The following questions need not be adhered to literally by the Examiner, and are not all to be asked; but the substance of the leading questions should be asked, and all that are asked should be satisfactorily answered, before an applicant is reported to have passed his examination. The Examiner should make such a selection of the questions as each case appears to him to require.

THOMAS GRAY,  
Assistant Secretary.

Board of Trade,  
Marine Department.

HEADS of EXAMINATION in REGULATIONS respecting LIGHTS and  
FOG SIGNALS and in the STEERING and SAILING RULES.

1. What light or lights are required by the regulations to be exhibited by sailing vessels at anchor?

One light only, viz., a white light.

2. What light or lights are required by the regulations to be exhibited by steam-ships at anchor?

The same as for sailing vessels.

3. Where is the anchor light to be exhibited?

Where it can best be seen. It must of course be placed where there is the least possible chance of obstruction from spars, ropes, &c., &c.

4. To what height may the anchor light be hoisted?

It may be exhibited at any height where it can best be seen not exceeding 20 feet above the deck.

5. What is the description of the lantern containing the anchor light required by the regulations?

A globular lantern of not less than eight inches in diameter.

6. In what direction or directions must the anchor light show?

It must show a clear, uniform, and unbroken light, visible all round the horizon.

7. At what distance must it be visible?

At least one mile.

8. What is the number of lights required by the regulations to be carried by sailing ships when under weigh at night?

Two side-lights, and to have in readiness a white light or a flare-up light to show from their stern to any vessel overtaking them.

9. Of what colour are these lights, and how are they to be placed on board the ship?

A green light on the starboard side, and a red light on the port side.

10. What description of light must be shown from the sides of sailing vessels under weigh; and over how many points of the compass, and in what directions, and how far, are they required to show?

Each light must be so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass; so fixed as to throw the light from right ahead to two points abaft the beam on the starboard and port sides respectively;

and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles.

11. What lights are they to carry when being towed at night ?

The same.

12. Are the side-lights required to be fitted with screens ; and if so, of what length, and how ?

Yes, on the inboard side ; at least three feet in length, measuring forward from the light. They are to be so fitted as to prevent the coloured lights from being seen across the bows.

13. What is the number of lights required by the regulations to be carried by steam-ships when under steam at night ?

Three lights, and to have in readiness a white light or flare-up light to show from their stern to any vessel overtaking them.

14. Of what colour are these lights, and how are they to be placed on board the ship ?

A white light on or in front of the foremast at a height above the hull of not less than 20 feet, and if the breadth of the ship exceeds 20 feet, then at a height above the hull not less than such breadth. A green light on the starboard side, and a red one on the port side.

15. Over how many points of the compass, in what direction, and how far, is the foremast-head light of a steamer required to show ?

Over 20 points, viz., from right ahead to two points abaft the beam on both sides. It must be of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least five miles.

16. Are the side-lights required to be fitted with screens ; and if so, of what length ?

The green and red lights are to be fitted with screens on the inboard side, extending at least three feet forward from the light, as in the case of sailing vessels.

17. Over how many points of the compass, in what directions, and how far, are the coloured side-lights of steamers required to show ?

The side-lights must be so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass, on each side of the ship, i.e., from right ahead to two points abaft the beam on the starboard and port sides respectively, and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles.

18. What description of lights are steamers required by the regulations to carry when they are not under steam, but under sail only ?

Side-lights only, the same as sailing vessels.

19. What exceptional lights are to be carried by small sailing vessels in certain cases ?

Whenever, as in the case of small vessels during bad weather, the green and red side-lights cannot be fixed, these lights shall be kept on deck, on their respective sides of the vessel, ready for use ; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side, nor the red light on the starboard side.

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

20. What description of lights are pilot vessels required to carry when on their stations on pilotage duty ?

A pilot vessel, when engaged on her station on pilotage duty, shall not carry the lights required for other vessels, but shall carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

21. What description of lights are pilot vessels required to carry when not on their station on pilotage duty ?

A pilot vessel, when not engaged on her station on pilotage duty, shall carry lights similar to those of other ships.

22. What lights are open boats and fishing vessels of less than 20 tons net register required to carry when under way and not actually engaged in fishing.

Open boats and fishing vessels of less than 20 tons net registered tonnage, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the coloured side-lights ; but every such boat and vessel shall in lieu thereof have ready at hand a lantern with a green glass on the one side, and a red glass on the other side, and on approaching to, or being approached by another vessel, such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side, nor the red light on the starboard side.

23. What lights are fishing vessels and fishing boats of 20 tons net register, or upwards, required to carry when under way and not actually engaged in fishing?

They must carry similar lights to those of other ships when under way.

24. What lights are steam trawlers of 20 tons gross register, or upwards, whilst actually engaged in trawling, and not being stationary, required to carry?

All steam-vessels engaged in trawling must carry either one of the two following arrangements of lights, whichever of the two may be the more convenient:—

(a) The usual green and red side-lights, and foremast-head light, similar to those carried by other steam-ships; or

(b) They must carry on or in front of the foremast-head, and in the same position as the white light which other steam-ships are required to carry, a lanthorn showing a white light ahead, a green light on the starboard side, and a red light on the port side; such lanthorn shall be so constructed, fitted, and arranged as to show an uniform and unbroken white light over an arc of the horizon of four points of the compass, an uniform and unbroken green light over an arc of the horizon of 10 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 10 points of the compass, and it shall be so fixed as to show the white light from right ahead to two points on the bow on each side of the ship, the green light from two points on the starboard bow to four points abaft the beam on the starboard side, and the red light from two points on the port bow to four points abaft the beam on the port side: and (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform, and unbroken light all round the horizon; the lanthorn containing such white light shall be carried lower than the lanthorn showing the green, white, and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet, nor more than 12 feet.

25. What lights are sailing trawlers whilst actually engaged in trawling, and not being stationary, required to carry?

All sailing vessels, of whatever tonnage, whilst engaged in trawling, must carry either one of the three following arrangements of lights, whichever of the three, (a), (b), or (c), may be the most convenient:—

(a) They may carry the green and red side-lights similar to those of other sailing ships; or

(b) They may carry on or in front of the foremast-head a lanthorn having a green glass on the starboard side and a red glass on the port side, so constructed, fitted, and arranged that the red and green do not converge, and so as to show an uniform and unbroken green light over an arc of the horizon of 12 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 12 points of the compass, and it shall be so fixed as to show the green light from right ahead to four points abaft the beam on the starboard side and the red light from right ahead to four points abaft the beam on the port side; and (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform and unbroken light all round the horizon; the lanthorn containing such white light shall be carried lower than the lanthorn showing the green and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet and not more than 12 feet; or

(c) They may carry a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear, uniform and unbroken light all round the horizon, and visible on a dark night, with a clear atmosphere, for a distance of at least 2 miles; and also a sufficient supply of red pyrotechnic lights which shall each burn for at least 30 seconds, and shall, when so burning, be visible for the same distance under the same conditions as the white light. The white light shall be shown from sunset to sunrise, and one of the red pyrotechnic lights shall be shown on approaching, or on being approached by, another ship or vessel in sufficient time to prevent collision.

26. What lights are vessels whilst actually engaged in drift net fishing required to carry?

All vessels when engaged in fishing with drift nets shall exhibit two white lights from any part of the vessel where they can be best seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 feet and not more than 10 feet; and so that the horizontal distance between them measured in a line with the keel of the vessel shall be not less than 5 feet and not more than 10 feet. The lower of these two lights shall be the more forward, and both of them shall be of such a character and contained in lanterns of such construction as to show all round the horizon, on a dark night, with a clear atmosphere, for a distance not less than three miles.

27. What lights are vessels whilst actually engaged in line fishing required to carry?

A vessel engaged in line fishing is required to carry the same lights as a vessel engaged in drift net fishing.

28. If a vessel, when fishing, becomes stationary in consequence of her gear getting fast to a rock or other obstruction, what signal must she make?

She must show the same light, and if a fog, mist, or falling snow prevail, she must make the same fog signals as if she were at anchor.

29. What lights are fishing vessels and open boats required to exhibit when at anchor?

Between sunset and sunrise they must exhibit a white light, visible all round the horizon at a distance of at least one mile, the same as any other vessel.

30. What sound signals are fishing vessels required to make whilst engaged in fishing in thick weather?

In fog, mist, or falling snow, a drift net vessel attached to her nets, and a vessel when trawling, dredging, or fishing with any kind of drag net, and a vessel employed in line fishing with her lines out, shall at intervals of not more than two minutes make a blast with her fog-horn and ring her bell alternately.

31. May fishing vessels and open boats use flare-up lights, and if so, at what part, or parts, of the vessel should they be exhibited?

Yes. Fishing vessels and open boats may at any time use a flare-up in addition to the lights which they are by this article required to carry and show. All flare-up lights exhibited by a vessel when trawling, dredging, or fishing with any kind of drag net shall be shown at the after part of the vessel, excepting that, if the vessel is hanging by the stern to her trawl, dredge, or drag net, they shall be exhibited from the bow.

32. Do these regulations referring specially to fishing vessels and boats apply to foreign vessels, and to all parts of the world?

No, with the exception of the *first paragraph* of Article 10 of the regulations, they apply only to British vessels and boats when in the sea off the coast of Europe lying north of Cape Finisterre.

33. What lights are steam-ships required to carry when towing other ships?

A steam-ship, when towing another ship, shall, in addition to her side-lights, carry two bright white lights in a vertical line one over the other, not less than three feet apart, so as to distinguish her from other steam-ships. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light which other steam-ships are required to carry.

34. What light is a ship which is being overtaken by another required to show?

A ship which is being overtaken by another shall show from her stern to such last-mentioned ship a white light or a flare-up light.

35. Describe the lights and the day signals that vessels employed in laying or picking up a telegraph cable are required to carry.

A ship, whether a steam-ship or a sailing ship employed in laying or in picking up a telegraph cable, shall at night carry in the same position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line over one another, not less than six feet apart: the highest and lowest of these lights shall be red and the middle light shall be white, and they shall be of such a character that the red lights shall be visible at the same distance as the white light. By day she shall carry in a vertical line one over the other, not less than six feet apart, in front of, but not lower than her foremast-head, three shapes not less than two feet in diameter, of which the top and bottom shall be globular in shape and red in colour, and the middle one diamond in shape and white.

36. Describe the lights and the day signals that vessels which from any cause are not under command are required to carry.

A ship, whether a steam-ship or a sailing ship, which from any accident is not under command, shall at night carry, in the same

position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three red lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over the other, not less than three feet apart, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles; and shall by day carry in a vertical line, one over the other, not less than three feet apart, in front of but not lower than her foremast-head, three black balls or shapes, each two feet in diameter.

37. Are the above-mentioned ships to carry side-lights?

The above ships, when not making any way through the water, shall not carry the side-lights, but when making way shall carry them.

38. What are the previous mentioned shapes and lights intended to indicate to approaching ships?

These shapes and lights are to be taken by approaching ships as signals that the ship using them is not under command, and cannot therefore get out of the way.

39. Do these rules prevent squadrons and convoys from carrying special lights?

No. Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war, or for ships sailing under convoy.

40. What sound signals are steam-ships and sailing ships required by the regulations to be provided with?

A steam-ship shall be provided with a steam whistle or other efficient steam sound signal, so placed that the sound may not be intercepted by any obstructions, and with an efficient fog-horn to be sounded by bellows or other mechanical means, and also with an efficient bell. A sailing ship shall be provided with a similar fog-horn and bell.

41. When are these signals to be used?

In fog, mist, or falling snow, whether by day or night.

42. What sound signal is to be made by steam-ships and sailing ships when not under way?

A steam-ship and a sailing ship when not under way shall, at intervals of not more than two minutes, ring the bell.

43. What sound signal is required to be made by a steam-ship when under way?

A steam-ship under way shall make with her steam whistle, or other steam sound signal, at intervals of not more than two minutes, a prolonged blast.

44. What sound signals are required to be made by sailing ships when under way?

A sailing ship under way shall make with her fog-horn, at intervals of not more than two minutes, when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.

45. Do the regulations require ships to take any other precaution during thick weather?

Yes. Art. 18 says every ship, whether a sailing ship or steamship, shall, in a fog, mist, or falling snow, go at a moderate speed.

46. Is it optional for a steam-ship to make any other signals with her steam whistle?

Yes; but only to vessels in sight, i.e., not to vessels which are so obscured by fog, mist, or falling snow that they cannot be seen, though their whistles may be heard.

Art. 19 provides that in taking any course authorised or required by the regulations, a steam-ship under way may indicate that course to any other ship which she has in sight by the following signals on her steam whistle, viz.:—

One short blast to mean "I am directing my course to starboard : "

Two short blasts to mean "I am directing my course to port : "

Three short blasts to mean "I am going full speed astern."

The use of these signals is optional; but if they are used, the course of the ship must be in accordance with the signal made.

47. What precaution is to be taken by steamers approaching another vessel?

If there is risk of collision, the steamer is to slacken speed, or, if necessary, stop and reverse.

48. If you see two white lights in a vertical line one over the other, what do they denote as regards the vessel carrying them?

They denote the presence of a steamer towing with her side lights not within sight on account of distance, fog, &c.; or a vessel end on to me engaged in drift net fishing, or in line fishing, or it may be a steam trawler end on, or within 2 points of being end on, to me.

49. If you see a green, or a red, light with a white light below, what do they denote?

They denote the presence of either a sailing, or a steam, vessel engaged in trawling.

50. If you see both the green and red lights with a white light below them, what do they denote?

They denote the presence of a sailing trawler coming end on to me.

51. If you see a white light alone, what does it denote as regards the ship carrying it?

It denotes the presence of a vessel or boat at anchor; or a pilot vessel on her station; or the mast-head light of a vessel, under steam, with her side-lights not within sight on account of distance, fog, &c., or a fishing vessel stationary through her gear getting fast to some obstruction, or a sailing traveller engaged in trawling (1) under one arrangement of lights heading so that her side-lights are obscured, (2) under another arrangement from the red pyrotechnic light not having been exhibited, or it may be a light shown from the stern of a vessel which is being overtaken.

52. If you see a green or a red light without a white light, or both a green and a red light without a white light, is the vessel carrying the light or lights seen, a vessel under steam or a vessel under sail?

A vessel under sail.

53. How do you know?

Because there is no white mast-head light.

54. If you see a white light over a coloured light, is the vessel a vessel under sail or a vessel under steam?

A vessel under steam. The mast-head light denotes that the vessel is under steam.

[The Examiner will then take one model of a vessel, which he will place on the table, and call it A. He will then take the mast or stand with a white and a red ball on it, and place it at the other end of the table and call it B.]

The Examiner should be careful that the model of one vessel only is used when the questions numbered 55 to 60 are asked.]

55. As A is a steamer going north, seeing a white light and red light right ahead at B. Are A and the vessel B showing the two lights meeting end on or nearly end on, or is B passing A, or is B crossing the path of A, and in what direction, and how do you know?

Passing to port, because if I see a red light ahead, I know that the head of the vessel carrying that red light must be pointing away in some direction to my own port or left hand. The ship showing the red light has her port or left side more or less open to A.

56. If A is going north, within what points of the compass must the vessel B showing the white and red lights be steering?

B must be going from a little W. of S. to W.N.W.

57. How do you know this?

Because the screens being properly fitted, I could not see the red light of B at all with the vessel's head in any other direction.

58. A is a steamer going north, and seeing a white and green light ahead. Are A and B meeting, or is B passing A, or is B crossing the course of A, and in what direction; and how do you know?

B is passing to starboard of A, because if I see a green light ahead, I know that the head of the vessel carrying that green light must be pointing away in some direction to my starboard or right hand. The ship showing the green light has her right or starboard side more or less open to me.

59. As A is going north, within what points of the compass must the vessel showing the white and green lights be steering?

B must be going from a little E. of South to E.N.E.

60. How do you know?

Because the screens being properly fitted, I cannot see the green light at all with the vessel's head in any other direction.

61. If a steamer A sees the three lights of another steamer B ahead or nearly ahead, are the two steamers meeting, passing, or crossing?

Meeting end on, or nearly end on.

62. Do the regulations expressly require the course of a ship to be altered to starboard in any case; and if so, when?

Yes; in the case of two steamers meeting end on, or nearly end on.

63. Do they expressly require the course of a ship to be altered to starboard in any other case; and if so, in what other?

No. It is not in any other case expressly required by the regulations.

[The Examiner should see that the candidate puts the models in the position indicated by the question 64, and following.]

64. If a steamer A sees another steamer's red light B on her own starboard side, are the steamers meeting, passing, or crossing; and how do you know?

Crossing, because the red light of one is opposed to the green light of the other ; and whenever a green light is opposed to a red light, or a red light to a green light, the ships carrying the lights are crossing ships.

65. Is A to stand on ; and if not, why not ?

A has the other vessel B on her own starboard side. A knows she is crossing the course of B, because she sees the red light of B on her (A's) own starboard side. A also knows she must get out of the way of B, because Article 16 expressly requires that the steamer that has the other on her own starboard side shall keep out of the way of the other.

66. Is A to starboard or to port in such a case ?

A must do what is right so as to get herself out of the way of B : it is generally preferable to pass under a ship's stern rather than attempt to cross her bows, but it depends entirely on the position and relative speed of the two ships, and therefore the regulations wisely leave the giving way ship to get out of the way in any manner that may be most desirable, so always that she does get out of the way.

67. If A gets into collision by porting, will it be because she is acting on any rule ?

No ; the rule does not require her either to port or to starboard. If she ports, and gets into collision by porting, it is not the fault of any rule.

68. If a steamer A sees the green light of another steamer B on her own (A's own) port bow, are the two steamers meeting, passing, or crossing ; and how do you know ?

Crossing, because the green light of one ship is shown to the red light of the other.

69. What is A to do, and why ?

By the rule contained in Article 22 of the Regulations, A is required to keep her course, subject only to the qualification that due regard must be had to all dangers of navigation ; and that due regard must also be had to any special circumstances which may exist in any particular case rendering a departure from that rule necessary in order to avoid immediate danger. The crossing ship B on A's port side must get out of the way of A, because A is on B's starboard side.

70. A, a steamer, sees the green light of another steamer, B, a point on her A's port bow. Is there any regulation requiring A to port in such a case ; and if so, where is it to be found ?

There is not any.

71. Are steam-ships to get out of the way of sailing ships ?

If a steamer and a sailing ship are proceeding in such direction as to involve risk of collision, the steamer is to get out of the way of the sailing ship, unless the sailing ship is overtaking the steamer.

72. What is to be done by A, whether a steamer or a sailing ship, if overtaking B ?

A is to keep out of the way of B.

73. When the by rules one of two ships is required to keep out of the way of the other, what is the other to do ?

To keep her course. This is absolutely necessary to enable the commander of the ship required by the regulations to keep out of the way, to act with decision and promptitude, which he cannot possibly, unless he knows what the other vessel is going to do.

74. Is there any qualification or exception to this ?

Yes. Due regard must be had to all dangers of navigation, and to any special circumstances which may exist in any particular case, and require a departure from the regulations to avoid immediate danger.

75. Is there any general direction in the steering and sailing rules ; and if so, what is it ?

Yes, it is this : that nothing in the rules shall exonerate any ship, or the owner, master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

76. Can you repeat article ( — ) of the regulations, I refer to the article containing the rule for ( — ) ?

[The Examiner should repeat this question, naming a different article each time.]

77. What does the Act of Parliament provide as to the obligation of owners and masters in obeying the regulations respecting lights, fog signals, and steering and sailing ?

Section 27 of "the Merchant Shipping Act Amendment Act, 1862," provides that owners and masters shall be bound to obey the regulations, and it also provides that in case of wilful default

by the master or owner he shall be deemed to be guilty of a misdemeanor for each infringement.

78. What do breaches of the regulations imply ?

If an accident happens through non-observance of the regulations, it implies wilful default on the part of the person in charge of the deck at the time, unless it is shown to the satisfaction of the court hearing the case that the special circumstances of the case rendered a departure from the rules necessary.

79. If collision ensues from a breach of these regulations, who is to be deemed in fault for the collision ?

The person by whom the regulations are infringed, unless the court hearing the case decides to the contrary.

80. Is there any special rule for steam-ships navigating narrow channels ?

In narrow channels every steam-ship shall, when it is safe and practicable, keep to that side of the fairway or mid-channel which is on the starboard side of such ship.

81. Do the regulations apply to sea-going ships in harbours, and in rivers ?

Yes: unless there is any rule to the contrary made by a competent authority.

82. Do they apply to British ships only ?

No, to foreign ships as well, with the exception of paragraphs (a), (b), (c), (d), (e), (f) and (g) of Article 10, which apply to only British fishing vessels.

83. Do you know where the present regulations are to be found ?

Yes, in the Orders in Council of the 11th August 1884, the 30th December 1884, and 24th June 1885. Copies are given away on application to the Board of Trade.

84. Is one ship bound to assist another in case of collision ?

Yes.

85. What is the penalty for default ?

If the master or person in charge of the ship fails to render assistance without reasonable excuse, the collision is, in absence of proof to the contrary, to be deemed to be caused by his wrongful act, neglect, or default.

86. Is there any other penalty attached to not rendering assistance ?

Yes. If it is afterwards proved that he did not render assistance, his certificate may be cancelled or suspended by the court investigating the case.

87. Is it not expected that you should understand the regulations before you take charge of the deck of a ship ?

It is.

88. Why ?

If I do not understand them and am guilty of default, the consequences will be very serious to me.

89. What would be a serious offence ?

To cause a collision by porting the helm or doing anything not required by the regulations and without due consideration.

### **Regulations for preventing collisions at sea.**

#### **Order in Council of 11th August 1884.**

##### *Preliminary.*

Art. 1. Is the following rules every steam-ship which is under sail and not under steam is to be considered a sailing ship; and every steam-ship which is under steam, whether under sail or not, is to be considered a ship under steam.

##### *Rules concerning Lights.*

Art. 2. The lights mentioned in the following Articles, numbered 3, 4, 5, 6, 7, 8, 9, 10 and 11, and no others, shall be carried in all weathers, from sunset to sunrise.

Art. 3. A sea-going steam-ship when under way shall carry—

(a) On or in front of the foremast, at a height above the hull of not less than 20 feet, and if the breadth of the ship exceeds 20 feet, then at a height above the hull not less than such breadth, a bright white light, so constructed as to show an uniform and unbroken light over an arc of the horizon of 20 points of the compass; so fixed as to throw the light 10 points on each side of the ship, viz. from right ahead to two points abaft the beam on either side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least five miles.

(b) On the starboard side, a green light so constructed as to show an uniform and unbroken light over an arc of the

horizon of 10 points of the compass; so fixed as to throw the light from right ahead to 2 points abeam on the starboard side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles.

- (c) On the port side, a red light, so constructed as to show an uniform and unbroken light over an arc of the horizon of 10 points of the compass; so fixed as to throw the light from right ahead to 2 points abeam the beam on the port side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles.
- (d) The said green and red side-lights shall be fitted with inboard screens projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

**Art. 4.** A steam-ship, when towing another ship, shall in addition to her side-lights, carry two bright white lights in a vertical line one over the other, not less than three feet apart, so as to distinguish her from other steam-ships. Each of these lights shall be of the same construction and character, and shall be carried in the same position, as the white light which other steam-ships are required to carry.

**Art. 5. (a.)** A ship, whether a steam-ship or a sailing ship, which from any accident is not under command, shall at night carry, in the same position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three red lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over the other, not less than three feet apart, and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles; and shall by day carry in a vertical line, one over the other, not less than three feet apart, in front of, but not lower than, her foremast-head, three black balls or shapes, each two feet in diameter.

**(b.)** A ship, whether a steam-ship or a sailing ship, employed in laying or in picking up a telegraph cable, shall at night carry in the same position as the white light which steam-ships are required to carry, and, if a steam-ship, in place of that light, three lights in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over another, not less than six feet apart: the highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character that the red lights shall be visible at the same distance as the white light. By day she shall carry in a vertical line one over the other, not less than six feet apart, in front of, but not lower than, her foremast-head, three shapes not less than two feet in diameter, of which the top and bottom shall be globular in shape and red in colour, and the middle one diamond in shape and white.

**(c.)** The ships referred to in this Article, when not making any way through the water, shall not carry the side-lights, but when making way, shall carry them.

**(d.)** The lights and shapes required to be shown by this Article are to be taken by other ships as signals that the ship showing them is not under command, and cannot therefore get out of the way. The signals to be made by ships in distress and requiring assistance are contained in Article 27.

**Art. 6.** A sailing ship under way, or being towed, shall carry the same lights as are provided by Article 3 for a steam-ship under way, with the exception of the white light, which she shall never carry.

**Art. 7.** Whenever, as in the case of small vessels during bad weather, the green and red side-lights cannot be fixed, these lights shall be kept on deck, on their respective sides of the vessel, ready for use; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side, nor the red light on the starboard side.

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

**Art. 8.** A ship, whether a steam-ship or a sailing ship, when at anchor, shall carry, where it can best be seen, but at height not exceeding 20 feet above the hull, a white light, in a globular lantern of not less than eight inches in diameter, and so constructed as to show a clear, uniform and unbroken light visible all round the horizon at a distance of at least one mile.

**Art. 9.** A pilot vessel, when engaged on her station on pilotage duty, shall not carry the lights required for other vessels, but

shall carry a white light at the masthead, visible all round the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

A pilot vessel, when not engaged on her station on pilotage duty, shall carry lights similar to those of other ships.

Art. 10. Open boats and fishing vessels of less than 20 tons net registered tonnage, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the coloured side-lights; but every such boat and vessel shall in lieu thereof have ready at hand a lantern with a green glass on the one side and a red glass on the other side, and on approaching to, or being approached by another vessel, such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side, nor the red light on the starboard side.

The following portion of this article applies only to fishing vessels and boats when in the sea off the coast of Europe lying north of Cape Finisterre:—

- (a) All fishing vessels and fishing boats of 20 tons net registered tonnage, or upwards, when under way and when not required by the following regulations in this article to carry and show the lights therein named, shall carry and show the same lights as other vessels under way.
- (b) All vessels when engaged in fishing with drift nets shall exhibit two white lights from any part of the vessel where they can be best seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 feet and not more than 10 feet; and so that the horizontal distance between them measured in a line with the keel of the vessel shall be not less than five feet, and not more than 10 feet. The lower of these two lights shall be the more forward, and both of them shall be of such a character, and contained in lanterns of such construction as to show all round the horizon, on a dark night with a clear atmosphere, for a distance of not less than three miles.
- (c) A vessel employed in line fishing with her lines out shall carry the same lights as a vessel when engaged in fishing with drift nets.
- (d) If a vessel when fishing becomes stationary in consequence of her gear getting fast to a rock or other obstruction, she shall show the light and make the fog signal for a vessel at anchor.
- (e) Fishing vessels and open boats may at any time use a flare-up in addition to the lights which they are by this Article required to carry and show. All flare-up lights exhibited by a vessel when trawling, dredging, or fishing with any kind of drag net shall be shown at the after part of the vessel, excepting that, if the vessel is hanging by the stern to her trawl, dredge, or drag net, they shall be exhibited from the bow.
- (f) Every fishing vessel and every open boat when at anchor between sunset and sunrise shall exhibit a white light visible all round the horizon at a distance of at least one mile.
- (g) In fog, mist, or falling snow, a drift net vessel attached to her nets and a vessel when trawling, dredging, or fishing with any kind of drag net, and a vessel employed in line fishing with her lines out, shall at intervals of not more than two minutes make a blast with her fog-horn and ring her bell alternately.

Art. 11. A ship which is being overtaken by another shall show from her stern to such last-mentioned ship a white light or a flare-up light.

#### *Sound Signals for Fog, &c.*

Art. 12. A steam-ship shall be provided with a steam whistle or other efficient steam sound signal, so placed that the sound may not be intercepted by any obstructions, and with an efficient fog horn to be sounded by a bellows or other mechanical means, and also with an efficient bell.\* A sailing ship shall be provided with a similar fog-horn and bell.

In fog, mist, or falling snow, whether by day or night, the signals described in this Article shall be used as follows; that is to say—

- (a) A steam-ship under way shall make with her steam whistle, or other steam sound signal, at intervals of not more than two minutes, a prolonged blast.
- (b) A sailing ship under way shall make with her fog-horn, at intervals of not more than two minutes, when on the

\* In all cases where the regulations require a bell to be used, a drum will be substituted on board Turkish vessels.

starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.

- (c) A steam-ship and a sailing ship, when not under way shall, at intervals of not more than two minutes, ring the bell.

*Speed of Ships to be moderate in Fog, &c.*

Art. 13. Every ship, whether a sailing ship or steam-ship, shall in a fog, mist, or falling snow, go at a moderate speed.

*Steering and Sailing Rules.*

Art. 14. When two sailing ships are approaching one another so as to involve risk of collision, one of them shall keep out of the way of the other, as follows, viz.—

- (a) A ship which is running free shall keep out of the way of a ship which is close-hauled.
- (b) A ship which is close-hauled on the port tack shall keep out of the way of a ship which is close-hauled on the starboard tack.
- (c) When both are running free with the wind on different sides, the ship which has the wind on the port side shall keep out of the way of the other.
- (d) When both are running free with the wind on the same side, the ship which is to windward shall keep out of the way of the ship which is to leeward.
- (e) A ship which has the wind aft shall keep out of the way of the other ship.

Art. 15. If two ships under steam are meeting end on, or nearly end on, so as to involve risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other.

This Article only applies to cases where ships are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two ships which must, if both keep on their respective courses, pass clear of each other.

The only cases to which it does apply are, when each of the two ships is end on, or nearly end on, to the other; in other words, in cases in which, by day, each ship sees the masts of the other in a line, or nearly in a line, with her own; and by night, to cases in which each ship is in such a position as to see both the side-lights of the other.

It does not apply, by day, to cases in which a ship sees another ahead crossing her own course; or by night, to cases where the red light of one ship is opposed to the red light of the other, or where the green light of one ship is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

Art. 16. If two ships under steam are crossing, so as to involve risk of collision, the ship which has the other on her own starboard side shall keep out of the way of the other.

Art. 17. If two ships, one of which is a sailing ship, and the other a steam-ship, are proceeding in such directions as to involve risk of collision, the steam-ship shall keep out of the way of the sailing ship.

Art. 18. Every steam-ship, when approaching another ship, so as to involve risk of collision, shall slacken her speed or stop and reverse, if necessary.

Art. 19. In taking any course authorised or required by these Regulations, a steam-ship under way may indicate that course to any other ship which she has in sight by the following signals on her steam whistle, viz.—

One short blast to mean "I am directing my course to starboard;"

Two short blasts to mean "I am directing my course to port;"

Three short blasts to mean "I am going full speed astern."

The use of these signals is optional; but if they are used, the course of the ship must be in accordance with the signal made.

Art. 20. Notwithstanding anything contained in any preceding Article, every ship, whether a sailing ship or a steam-ship, overtaking any other shall keep out of the way of the overtaken ship.

Art. 21. In narrow channels every steam-ship shall, when it is safe and practicable, keep to that side of the fairway or mid-channel which lies on the starboard side of such ship.

Art. 22. Where by the above rules one of two ships is to keep out of the way, the other shall keep her course.

Art. 23. In obeying and construing these rules due regard shall be had to all dangers of navigation; and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

*No Ship, under any circumstances, to neglect proper Precautions.*

Art. 24. Nothing in these rules shall exonerate any ship, or the owner, or master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look-out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

*Reservation of Rules for Harbours and Inland Navigation.*

Art. 25. Nothing in these rules shall interfere with the operation of a special rule, duly made by local authority, relative to the navigation of any harbour, river, or inland navigation.

*Special Lights for Squadrons and Convoy.*

Art. 26. Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war or for ships sailing under convoy.

Art. 27. When a ship is in distress, and requires assistance from other ships or from the shore, the following shall be the signals to be used or displayed by her, either together or separately, that is to say—

In the day-time—

1. A gun fired at intervals of about a minute.
2. The International Code signal of distress indicated by N C.
3. The distant signal, consisting of a square flag, having either above or below it a ball or anything resembling a ball.

At night—

1. A gun fired at intervals of about a minute.
2. Flames on the ship (as from a burning tar barrel, oil barrel, &c.).
3. Rockets or shells, throwing stars of any colour or description, fired one at a time, at short intervals.

ORDERS IN COUNCIL OF 30TH DECEMBER 1884  
AND 24TH JUNE 1885.

ALTERNATIVE LIGHTS FOR TRAWLERS WHEN ENGAGED IN  
TRAWLING, HAVING THEIR TRAWLS IN THE WATER AND  
NOT BEING STATIONARY.

1884.—PART I.—STEAM-VESSELS OF 20 TONS GROSS REGISTER  
TONNAGE OR UPWARDS.

(1.) On or in front of the foremast head and in the same position as the white light which other steam-ships are required to carry, a lanthorn showing a white light ahead, a green light on the starboard side, and a red light on the port side, such lanthorn shall be so constructed, fitted, and arranged as to show an uniform and unbroken white light over an arc of the horizon of four points of the compass, an uniform and unbroken green light over an arc of the horizon of 10 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 10 points of the compass, and it shall be so fixed as to show the white light from right ahead to two points on the bow on each side of the ship, the green light from two points on the starboard bow to four points abaft the beam on the starboard side, and the red light from two points on the port bow to four points abaft the beam on the port side: (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, the lanthorn containing such white light shall be carried lower than the lanthorn showing the green, white, and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet nor more than 12 feet.

1884.—PART II.—SAILING VESSELS OF 20 TONS NET REGISTER  
TONNAGE OR UPWARDS.

(1.) On or in front of the foremast head a lanthorn having a green glass on the starboard side and a red glass on the port side, so constructed, fitted, and arranged that the red and green do not converge, and so as to show an uniform and unbroken green light over an arc of the horizon of 12 points of the compass, and an uniform and unbroken red light over an arc of the horizon of 12 points of the compass, and it shall be so fixed as to show the green light from right ahead to four points abaft the beam on the starboard side, and the red light from right ahead to four points abaft

the beam on the port side; and (2) a white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, the lanthorn containing such white light shall be carried lower than the lanthorn showing the green and red lights as aforesaid, so, however, that the vertical distance between them shall not be less than 6 feet and not more than 12 feet.

## 1885.—SAILING TRAWLERS OF ANY TONNAGE.

As regards sailing vessels engaged in trawling, such vessels having their trawls in the water and not being stationary in consequence of their gear getting fast to a rock or other obstruction, if they do not carry and show the lights required by Article 6 of the Regulations aforesaid, or the other lights of the description set forth in Part 2 of the Schedule to the said recited Order in Council of the 30th of December, 1884, shall carry and show in lieu of the lights required by Article 6 of the Regulations aforesaid, or the other lights of the description set forth in paragraph 2 of the Schedule to the said recited Order, other lights as follows, that is to say:

A white light in a globular lanthorn of not less than eight inches in diameter, and so constructed as to show a clear uniform and unbroken light all round the horizon, and visible on a dark night with a clear atmosphere for a distance of at least 2 miles; and also a sufficient supply of red pyrotechnic lights which shall each burn for at least 30 seconds, and shall, when so burning, be visible for the same distance under the same conditions as the white light. The white light shall be shown from sunset to sunrise, and one of the red pyrotechnic lights shall be shown on approaching, or on being approached by another ship or vessel in sufficient time to prevent collision.

## AIDS TO MEMORY in four verses, by THOMAS GRAY.

## 1. Two Steam-ships meeting.

When both side-lights you see ahead—  
Port your helm and show your RED.

## 2. Two Steam-ships passing.

GREEN TO GREEN—or, RED TO RED—  
Perfect safety—Go ahead!

## 3. Two Steam-ships crossing.

*Note.*—This is the position of greatest danger: there is nothing for it but good look-out, caution, and judgment.

If to your starboard RED appear,  
It is your duty to keep clear;  
To act as judgment says is proper:—  
To port—or Starboard—Back,—or Stop her!  
But when upon your Port is seen  
A Steamer's Starboard Light of GREEN,  
There's not so much for you to do,  
For GREEN to Port keeps clear of you.

## 4. All Ships must keep a good look-out, and Steam-ships must stop and go astern, if necessary.

Both in safety and in doubt  
Always keep a good look-out;  
In danger, with no room to turn,  
Ease her, stop her, go astern.

14th October 1867.

## APPENDIX E.

## DISTRESS AND PILOT SIGNALS.

The following sections, together with the schedules referred to M. S. Act, 1873, therein, of the "Merchant Shipping Acts Amendment Act, 1873," relate to Signals of Distress and signals for Pilots. (See also "Regulations for preventing Collisions at sea." Article 27.)

18. The signals specified in the first schedule to this Act shall be deemed to be signals of distress.

Any master of a vessel who uses or displays, or causes or permits any person under his authority to use or display, any of the said signals, except in the case of a vessel being in distress, shall be liable to pay compensation for any labour undertaken, risk incurred, or loss sustained in consequence of such signal having been supposed to be a signal of distress, and such compensation may, without prejudice to any other remedy, be recovered in the same manner in which salvage is recoverable.

Signals for  
pilots.

19. If a vessel requires the services of a pilot, the signals to be used and displayed shall be those specified in the second schedule to this Act.

Any master of a vessel who uses or displays, or causes or permits any person under his authority to use or display, any of the said signals for any other purpose than that of summoning a pilot, or uses or causes or permits any person under his authority to use any other signal for a pilot, shall incur a penalty not exceeding twenty pounds.

Power to alter  
rules as to  
signals.

20. Her Majesty may from time to time by Order in Council repeal or alter the rules as to signals contained in the schedules to this Act, or make new rules in addition thereto, or in substitution therefor, and any alterations in or additions to such rules made in manner aforesaid shall be of the same force as the rules in the said schedules.

## SCHEDULES.

## SCHEDULE I.

## SIGNALS OF DISTRESS.

*In the day-time.*—The following signals, numbered 1, 2 and 3, when used or displayed together or separately, shall be deemed to be signals of distress in the day-time:—

1. A gun fired at intervals of about a minute;
2. The International Code signal of distress indicated by N C;
3. The distant signal, consisting of a square flag having either above or below it a ball, or anything resembling a ball.

*At night.*—The following signals, numbered 1, 2 and 3, when used or displayed together or separately, shall be deemed to be signals of distress at night:

1. A gun fired at intervals of about a minute;
2. Flames on the ship (as from a burning tar barrel, oil barrel, &c.);
3. Rockets or shells, of any colour or description, fired one at a time, at short intervals.

## SCHEDULE II.

## SIGNALS TO BE MADE BY SHIPS WANTING A PILOT.

*In the day-time.*—The following signals, numbered 1 and 2, when used or displayed together or separately, shall be deemed to be signals for a pilot in the day-time, viz.—

1. To be hoisted at the fore, the Jack or other national colour usually worn by merchant ships, having round it a white border, one-fifth of the breadth of the flag; or
2. The International Code pilotage signal indicated by P T.

*At night.*—The following signals, numbered 1 and 2, when used or displayed together or separately, shall be deemed to be signals for a pilot at night, viz.—

1. The pyrotechnic light, commonly known as a blue light, every fifteen minutes; or
2. A bright white light, flashed or shown at short or frequent intervals, just above the bulwarks, for about a minute at a time.

## APPENDIX F.

## EXAMINATION IN CHART.

*For all Grades where the Chart is used.*

[The candidate will be required to work out the following questions on either a "true" or "magnetic" chart\* whichever may be handed to him by the Examiner; and also determine whether the chart is a "true" or "magnetic" one, and whether it is for the northern or southern, and eastern or western hemisphere.]

\* The terms "true" and "magnetic" are used for the sake of brevity and convenience, for indicating charts that have compasses delineated upon them showing the "true" or "magnetic" point of the compass respectively.

1. Using deviation [card] [curve\*] No. , find the course to steer by compass from to ; also the distance.

Answer.—Compass course        
 Distance        
 Variation        
 Deviation     

2. With the ship's head on the above-named compass course a [point] [light-house] bore by compass and bore by the same compass, find the ship's position.

Answer.—Latitude        
 Longitude     

3. With the ship's head as above, a [point] [light-house] bore by compass , and after continuing on the same course miles it bore , find the position of ship and her distance from at the time of taking the second bearing.

Answer.—Latitude        
 Longitude        
 Distance     

All the foregoing questions must be answered, but this does not preclude the Examiner from putting any other questions of a practical character or which the local circumstances of the port may require.

Signature        
 Date        
 Chart used     

*Additional for Masters.*

4. Find the course to steer by compass from to (see Question 1) to counteract the effect of a current which set at the rate of miles per hour, the ship making by log miles per hour; also the distance the ship would then make good in hours towards

Answer.—Compass course        
 Distance     

5. On being off took a cast of the lead; required the correction to be applied to the depth obtained by the lead line before comparing it with the depth marked on the chart.

6. What do you understand the small numbers to indicate that you see placed about the chart, and at what time of tide?

7. What do the Roman numerals indicate that are occasionally seen near the coasts and in harbours?

8. How would you find, approximately, the time of high water at any place, the Admiralty tables not being at hand, nor any other special tables available?

All the foregoing questions, and those on Form Exn. 9C., must be answered, but this does not preclude the Examiner from putting any other questions of a practical character or which the local circumstances of the port may require.

Signature  
 Date

\* A Candidate for a Master's Certificate is expected to use either a card of deviations or a curve of deviations on a Napier's diagram, whichever the Examiner may think proper to put before him.

## APPENDIX G.

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DEVIATION OF THE COMPASS.

N. B.—The Examiner will not mark less than 12 of the following questions, which must be correctly answered by the candidate, and the Examiner's attention is specially called to the importance of Questions 7, 8, 9, 10, and 19, which should be marked in all cases.

1. What do you mean by Deviation of the Compass?
2. How do you determine the deviation (a) when in port, and (b) when at sea?
3. Having determined the deviation with the ship's head on the various points of the Compass, how do you know when it is easterly and when westerly?
4. Why is it necessary, in order to ascertain the deviations, to bring the ship's head in more than one direction?
5. For accuracy, what is the least number of points to which the ship's head should be brought?
6. How would you find the deviation when sailing along a well known coast?
7. In the following table give the correct magnetic bearing of the distant object, and thence the deviation:—

Ship's head by Standard Compass.	Bearing of distant object by Standard Compass.	Deviation required.	Ship's head by Standard Compass.	Bearing of distant object by Standard Compass.	Deviation required.
North			South		
N.-E.			S.-W.		
East			West		
S.-E.			N.-W.		

8. With the deviation as above, give the courses you would steer by the Standard Compass to make the following courses, correct magnetic [ ].
9. Supposing you have steered the following courses by the Standard Compass, find the correct magnetic courses made from the above deviation table [ ].
10. You have taken the following bearings of two distant objects by your Standard Compass as above; with the ship's head at [ ], find the bearings, correct magnetic [ ].
11. Name some suitable objects by which you could readily obtain the deviation of the Compass when sailing along the coasts of the English Channel.
12. Do you expect the deviation to change; if so, state under what circumstances?
13. How often is it advisable to test the accuracy of your table of deviations?
14. State briefly what you have chiefly to guard against in selecting a position for the Compass.
15. The Compasses of iron ships are more or less affected by what is termed the heeling error; on what courses does this error vanish, and on what courses is it the greatest?
16. State to which side of the ship, in the majority of cases, is the North point of the Compass drawn in the Northern Hemisphere; and what effect has it on the assumed position of the ship when she is steering on Northerly, and also on Southerly courses?
17. The effect being as you state, on what courses would you keep away, and on what courses would you keep closer to the wind, in order to make good a given Compass course?
18. Does the same rule hold good in both hemispheres with regard to the heeling error?
19. Your Steering Compass having a large error, how would you proceed to correct that Compass by compensating magnets and soft iron, in order to reduce the error within manageable limits?

## APPENDIX H.

—  
SYLLABUS OF EXAMINATION in the LAWS of the DEVIATION  
of the COMPASSES of an IRON SHIP, and in the Means of  
compensating or correcting it.

Candidates for the voluntary examination in Compass Deviation, and also for Extra Masters' Certificates, will be examined in the whole of this syllabus, and will be required to answer all

the questions correctly, and to the entire satisfaction of the Examiner.

1. Describe an artificial magnet, and how a steel bar or needle is usually magnetized.

2. [For the sake of simplicity it is desirable to adopt the nomenclature of the Astronomer Royal, and call that pole of the compass needle that points to the magnetic north the red, and the other the blue pole.] What effect has the pole of one magnet of either name on the pole of the same name of another magnet, and what would be the consequence of the pole of one magnet of either name being brought near enough to affect the pole of contrary name, if in these cases both magnets were freely suspended?

3. By applying this law to all magnets, natural as well as artificial, show what would be the result on a magnetic bar or needle, freely suspended, but by weight or by the nature of its mounting constrained to preserve a horizontal position; and what result, if so mounted, but free to move in every direction, the earth being regarded as a natural magnet?

4. Which is the red magnetic pole of the earth, and which the blue?

5. What is the cause of the variation of the compass?

6. What is meant by the deviation of the compass?

7. Describe the sub-permanent magnetism of an iron ship, and state when and how it is acquired, and which is the sub-permanent red, and which is the blue pole, and why it is called sub-permanent magnetism.

8. What is meant by "the composition of forces" and "the parallelogram of forces," and show how the knowledge of these is valuable in ascertaining and compensating the sub-permanent magnetism of an iron ship?

9. Describe the co-efficients B and C, plus (+), and minus (-), and why they are said to produce semi-circular deviations.

10. On what points by compass bearing of the ship's head does + B give westerly deviation, and on what does it give easterly; and also on what point does -- B give westerly, and on what points easterly?

11. On what points does + C give westerly, and on what points easterly; also on what points does -- C give westerly, and on what points easterly deviation?

12. How would you compensate the co-efficient C?

13. How would you compensate the co-efficient B?

14. If the value either of co-efficient B or C be given, also the magnetic direction of the ship's head while she was being built, how by the traverse tables would you determine the approximate value of the other co-efficient C or B; and if the value of both these co-efficients be given, how would you determine approximately the direction, by compass, of the ship's head whilst being built?

15. What is meant by transient induced magnetism?

16. Under what circumstances does induced magnetism give semi-circular deviation?

17. How would you compensate -- B resulting from induced magnetism, and why for this purpose would you adopt a different mode of compensation to that employed in correcting -- B produced by sub-permanent magnetism?

18. Describe quadrantal deviation, and state what co-efficients represent it; also on what points of the ship's head, by compass, each of these co-efficients gives the greatest amount of deviation.

19. On what points of the compass will each of these co-efficients, D and E + and --, give easterly, and on what points westerly deviation?

20. Generally + D gives the greatest amount of quadrantal deviation: how should it be compensated?

21. If D be compensated in the manner you have described, will it remain so in every latitude? If so, state the reason why.

22. What conditions of the iron of a ship will produce + D and what -- D?

23. Describe the nature of the deviation resulting from + A and -- A, and describe the error in the construction of the compass that frequently produces them.

24. Under what circumstances does the character of A and E so change as to render it desirable that these co-efficients should be disregarded or modified?

25. The value of A, B, C, D, and E being given, or B, C, and D only, find the deviation on any required point of the compass, or construct a table of deviation, if required.

26. Describe how you would determine the deviation by means of a distant object, by reciprocal bearings, or by the figures on the deck walls.

27. If it be required to determine the deviation of two or more compasses, it is most convenient to bring the ship's head, *correct* magnetic, on as many points as may be necessary. To determine the co-efficients B, C, and D, the bearing of the ship's head by each compass is required. How would you for this purpose employ a Graphic Method?

28. State your rule for determining whether deviation is easterly or westerly.

29. Describe the use of the "dumb card," or an azimuth card without a needle, in compensating a compass.

30. If you determine the deviation by an azimuth or an amplitude of a heavenly body, it is then combined with variation,\* which together is sometimes called the *correction* for the compass. State when the deviation is the difference between the variation and the *correction*, and when the sum; and when it is of the same name as that of the *correction*, and when of the contrary name.

31. In observing azimuths of heavenly bodies, the best method is by "time azimuths," since these can be observed without an altitude when the ship is in port, or the horizon cannot be defined from any cause. Given the sun's declination, the hour of the day, and the latitude to find the true bearing of the sun.<sup>†</sup>

32. By night, if it be desirable to observe the *correction* of the compass. Given the day of the year, and time at ship, also the latitude of the place to determine what star will be in good position for this purpose.

33. If your correcting magnets are so mounted that their positions can be altered, describe the process by which, on open sea, you can place the ship's head correct magnetic N. (or S.), and correct magnetic E. (or W.), and can make the correction perfect.

34. Given the name of a star, the time, the place of ship, the variation of the compass, and the bearing of the star by compass.

Determine the deviation, and name it east or west.

35. If an ordinary standard compass placed higher than the iron top sides be compensated whilst the ship is upright, what coefficient will be effected by heeling?

36. When generally will this co-efficient be plus, and when minus?

37. State the exceptions to this general rule.

38. Does the heeling error arise from the altered position of the sub-permanent poles of the ship, or from a change in the induced magnetism?

39. To what extent is the heeling error altered by a change in the magnetic latitude of the ship?

40. If a ship is beating to windward; when she tacks, under what circumstances will the heeling error retain the same name, and under what circumstances will it take the contrary name?

41. If a ship is placed on the opposite tack by the change of wind, the ship's course being the same by compass, will the heeling error change its name?

42. Under what circumstances will the heeling error, if disregarded, take the ship to windward, or when to leeward?

43. Can the heeling error be compensated? If so, state the means to be employed.

44. Can the compensation of the heeling error be depended on in every latitude? If not, state the reason.

45. Given the heel, the direction of the ship's head by compass, and the heeling error observed, to find the approximate heeling error, with a greater or less given heel, and with the ship's head on some other named point of the compass, the ship's magnetic latitude being in both cases the same.

46. Describe any instrument to show the ship's heel (generally called a clinometer), and state how and where it should be fixed.

47. Should the clinometer be observed when the ship is swung to determine the deviation when the ship is upright? If so, state the reason why.

## APPENDIX I.

### PARTICULARS OF EXAMINATION IN SUMNER'S METHOD BY PROJECTION.

Candidates are required to compute their longitude by chronometer worked with two assumed latitudes.

\* The magnetic variation is best determined by a chart of the curves of equal magnetic variation.

<sup>†</sup> The process of finding time azimuths by the ordinary formulæ of spherical trigonometry is tedious, and since on board an iron ship these observations should be often repeated, the candidate will be allowed to use any table or graphic or linear method that will solve the problem within a half of a degree, the altitude of the heavenly body not being given.

They are to mark off on the chart the two positions ascertained by the first altitude, and are then to connect them with a straight line, termed the *line of position*, or the line of equal altitude, which will show the bearing of any land it may intersect.

They will then be required to correct the first *line of position* for the ship's change of station, in the interval between the two observations, to project the *line of position* corresponding to the second observation on the chart, showing by its intersection with the first *line of position*, as corrected for change of station, the position of the ship at the time of the second observation.

The longitudes corresponding to the two latitudes by the second observation are no longer furnished by the Examiners. The candidates are consequently required to work out the whole of the problem for themselves (in place of the explanation recently required), and must be prepared to find the sun's true bearing by projection at the time of taking either the first or second observation; and when necessary to produce the *lines of positions* on the chart in order to make them cut one another should the position of the ship happen to be outside the parallels of the two assumed latitudes given in the question. Outline charts, extending from  $46^{\circ}$  to  $49^{\circ}$  and from  $49^{\circ}$  to  $52^{\circ}$  of latitude, respectively, are furnished by the Board of Trade to the different examiners for this purpose.

#### APPENDIX K.

The Candidate must answer in writing, on paper supplied to him by the Examiner, the following questions, numbering the answer to correspond with the questions.

Question—

1. The direction of the wind in a cyclone being\* \_\_\_\_\_ state the probable bearing of its centre from the ship in the\* \_\_\_\_\_ Hemisphere. Questions relating to cyclones or revolving storms common in tropical seas.
2. And suppose that the wind during the passage of the same cyclone were found to change towards the\* \_\_\_\_\_, what would be the ship's position with reference to the line of progression of the centre of the cyclone, and what action would you take?
3. Under what conditions would the change in the direction of the wind in the cyclone be the reverse of the above?
4. What are the usual indications of a ship being on the line of progression of the centre of a cyclone?
5. What are the usual indications that a ship is (a) approaching the centre of a cyclone; (b) receding from it?
6. Describe the track usually taken by cyclones in the \_\_\_\_\_, and state the seasons of the year in which they most frequently occur in that region.

#### APPENDIX L.

##### INSTRUCTIONS TO EXAMINERS.

###### *Examination in Colours.*

Herewith are—

- (a) A lanthorn having in it a lamp in which kerosine is to be burnt.
- (b) A slide having ground glass in it.
- (c) Nine slides, each having a coloured glass in it. The colours are as follows:—

1. Red (Standard).
2. Pink or salmon.
3. Green (Standard or No. 1).
4. Green (Bottle or No. 2).
5. Green\* (Pale or No. 3).
6. Yellow.
7. Neutral.\*
8. Blue (Standard).
9. Blue\* (Pale).

\* These spaces to be filled in by the Examiners, and frequently varied.  
† The Examiners to fill in whether North Atlantic, Bay of Bengal, China Seas, Indian Ocean, &c., &c.

## (d) Cards, five of each as follow :—

1. White.
2. Black.
3. Red.
4. Pink.\*
5. Green.
6. Drab.\*
7. Blue.
8. Yellow.

*Examination by Daylight. (Cards.)*

In conducting the examination by daylight, the examiner should do it in three ways—

1. The cards should be mixed up. The examiner should then hold up each card separately, and ask the candidate to name the colour, and if the candidate does so without hesitation, he is to be regarded as having passed the daylight test.
2. If the candidate hesitates in any of his answers, so as to raise a doubt in the mind of the examiner as to his ability to readily distinguish colours, the examiner should put all the cards on the table and require the candidate to select all cards of a colour or colours named by the examiner.
3. Having done that, they should all be mixed up again and the candidate should be required to sort the cards into eight heaps, putting all of one colour into each heap.
4. The result of the examination should be noted and recorded in each case.

*Examination by artificial Light.*

The room should be dark.

The lamp lighted and placed in the lanthorn.

The applicant should be seated or should stand so as to be opposite to the opening of the lanthorn, and at least 15 feet from the front of the lanthorn.

He should first of all see the light in the lanthorn without the interposition of any glass and be asked if it appears to him to have any colour; and if so, what colour?

The slide with the ground glass should then be put into the opening at the front of the lanthorn which is nearest to the light, and the applicant asked the same question.

The slide with the ground glass is to be left in, and the slides with the coloured glasses placed one by one and separately in front of it, and the candidate asked in each case to name the colour or tint.

The result of the examination should of course be noted and recorded in each case.

*General.*

The cards and glasses against which a star \* is placed in the list are what may be called confusion tints. The candidate is not to be regarded as having "failed" if he miscalls these tints, provided that he names all the others correctly. But if having named all the others correctly he miscalls these so far as to name the drab card No. 6 as red, pink, salmon, &c.; or to name card No. 7 as red, green, or yellow; or glass No. 2 as green, blue, or yellow; or glass No. 5 as red, pink, salmon, &c.; or glass No. 7 as bright red or bright green; or the plain ground glass any colour, the case should be reported for record. In short, if the candidate's perception or impression of these tints does not agree with the perception of the examiner, the case should be reported on the Form Exn. 17B.

The only reasons for which a candidate is to be reported as having failed are inability to distinguish red from green, or either from black, by daylight; and red from green, or either from the ground glass, by artificial light.

If a candidate fails in the colour test when the ground glass is in the lanthorn (as it is always to be when the coloured glasses are shown), he may also be tried over again with the coloured glasses without the intervention of the ground glass, and the result noted and recorded.

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APPENDIX M.

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## INSTRUCTIONS TO EXAMINERS.

*Compass Adjustment.*

It is of the utmost importance that masters of ships should thoroughly understand the tentative method of Compass Adjust-

ment as generally practised in merchant ships, and Examiners are therefore directed to fully satisfy themselves that all Candidates for Masters' Certificates have this particular knowledge. It should be tested in connexion with the Form of Examination, "Exn. 7," or it may be tested by Captain Beall's "Deviastope" at those ports which have been supplied with this instrument. Where the "Deviastope" is used it will not be necessary for the Candidates to give the written answers and sketches illustrative of the Question 19 of Form Examination 7.

A concise statement of the present method of tentative Compass Adjustment is forwarded for the use of Examiners. The Government wish them, however, distinctly to understand that the Government are not in any way advocating the correction of that part of co-efficient B which arises from vertical induction in soft iron by a permanent magnet instead of by a soft iron bar. The Government have no authority to interfere with the methods in use amongst Compass adjusters for the adjustment of Compasses in iron ships, but instruct the Examiners to satisfy themselves that masters are acquainted with the ordinary method as at present practised.

The examination by the "Deviastope" is at present only experimental, and no Candidate should be reported as having "failed" who does not pass the examination in it, provided he has answered satisfactorily the Question 19, "Exn. 7."

The "Deviastope" is sent only to three ports at present, and its extended use will depend upon experience at those ports.

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**The TENTATIVE METHOD of COMPASS ADJUSTMENT as generally practised by COMPASS ADJUSTERS in SHIPS of the MERCANTILE MARINE.**

Before describing the practice it will be as well to briefly state the co-efficients used to express the different magnetic forces:—

Co-efficient A represents a constant quantity.

"	B	"	semi-circular deviation due to fore and aft magnetic forces.
"	C	"	semi-circular deviation due to trans- verse magnetic forces.
"	D	"	quadrantal deviation due to hori- zontal induction in soft iron.
"	E	"	quadrantal deviation due to hori- zontal induction in soft iron un- symmetrically distributed.

**SIGNS and EFFECTS of CO-EFFICIENTS A, B, C, D, and E.**

Co-efficient A represents a constant deviation of the same nature and amount, on all points of the compass; + A signifying easterly, and — A, westerly deviation.

Co-efficient + B represents an attraction towards the ship's head, and causes easterly deviations with ship's head in the eastern semi-circle of the Compass, and westerly deviations in the western semi-circle, attaining a maximum value on the east and west points, decreasing to zero on north and south points, by Compass.

Co-efficient — B represents an attraction towards the ship's stern, and causes easterly deviations with ship's head in the western semi-circle, and westerly deviations with the ship's head in the eastern semi-circle, with a maximum value on the east and west points, decreasing to zero on the north and south points, by Compass.

Co-efficient + C represents an attraction towards the starboard side of the ship, and causes easterly deviations with ship's head in the northern semi-circle, and westerly deviations in the southern semi-circle, attaining a maximum value on the north and south points, decreasing to zero on the east and west points, by Compass.

Co-efficient — C represents an attraction towards the port side of the ship, and causes westerly deviations with ship's head in the northern semi-circle, and easterly in the southern semi-circle, attaining a maximum value on the north and south points, decreasing to zero on the east and west points, by Compass.

Co-efficient + D gives easterly deviations with ship's head between N. and E. and S. and W., and westerly deviations between S. and E. and N. and W.

Co-efficient — D gives results exactly the reverse to + D.

*Note.* — Both + D and — D have a maximum value on the four quadrantal points, and become zero on the cardinal points by Compass.

Co-efficient + E gives easterly deviations with ship's head between N.E. and N.W. and S.E. and S. W. and westerly deviations between N.E. and S.E. and N.W. and S.W.

Co-efficient - E gives results exactly the reverse to + E.

*Note.*—Both + E and - E have a maximum value on the cardinal points, and become zero on the four quadrantal points, but are usually very small in amount in Compasses placed in the middle line of the ship.

*Heeling Error.*—The heeling error arises partly from vertical induction in transverse iron, and iron vertical to the ship's deck, and partly from the vertical component of the sub-permanent magnetism of the ship. In the Northern Hemisphere in the majority of cases the N. point of the Compass needle is drawn to windward or the high side of the ship, with, as a rule, a maximum heeling error on N. and S. points, and zero on E. and W. points by Compass. If the Compass is not properly placed in the ship, there may be a sensible heeling deviation on E. and W. courses.

#### TENTATIVE CORRECTIONS.

*To correct co-efficient C.*—With ship's head north or south, magnetic, place a bar magnet (or more than one if necessary) horizontally and exactly athwart ship, either on the deck or on any convenient platform, with its centre on the fore and aft line passing through the centre of the Compass card, placing its red or marked end to starboard if the N. point of the needle deviates to the starboard side, or to port if it deviates to the port side of the ship, moving the magnet to or from the Compass until it points correctly.

*Note.*—The deviation represented by co-efficient C varies inversely as the earth's horizontal force, providing the iron is symmetrically arranged on each side of the Compass.

*To correct co-efficient B.*—With ship's head east or west, magnetic, place a bar magnet (or more than one if necessary) horizontally and exactly parallel to the fore and aft midship line of the ship, either on the deck or on any convenient platform, with its centre on the athwart ship line passing through the centre of the Compass, the red or marked end of the magnet being directed aft if the end point of the Compass needle deviates towards the stern, or forward if it deviates towards the bow, moving the magnet to or from the Compass until it points correctly.

*Note.*—The co-efficient B consists of two parts: one is due to the permanent magnetism of the ship, which varies inversely as the earth's horizontal force; the other to vertical induction in soft iron, which varies as the tangent of the dip. As ships in the merchant service are rarely built with a view of providing a satisfactory position for the standard Compasses, it is very difficult in many ships to find a position for it where it will not be affected by vertical iron. It follows, therefore, that if this deviation be compensated, as is customary, by a fore and aft permanent magnet instead of by a vertical soft iron bar, the poles of the magnet may in some cases require to be reversed in high southern latitudes.

*To correct co-efficient + D.*—With ship's head on one of the quadrantal points, magnetic, the + D is generally corrected by boxes of small chain, cylinders of soft iron, or soft iron globes placed athwart ship on the same level, and at equal distances, on the port and starboard sides of the Compass, with the centre of their mass on a level with the Compass needle, move them to or from the Compass till the needle points correctly.

*To correct co-efficient - D.*—Co-efficient - D, which is of very rare occurrence, is corrected by placing the above correctors on the fore and aft sides of the compass.

*Note.*—When once the co-efficient D is properly corrected by soft iron it is correct for all magnetic latitudes, provided the distribution of the iron in the ship is not materially changed, and provided the magnetism of the soft iron has not been affected by the Compass needles. With short needles having small magnetic power, such for instance as Sir Wm. Thomson's, there will probably be no change; but when the needles are long and powerful, one-half the original D may be expected to return when approaching the magnetic equator. See Admiralty Manual, 1882, page 96, as follows:—"When a compass with long and powerful needles is employed, "soft iron correctors placed very near it become mag- "netized by induction according to the power of the

" needles, and the resulting correction will not remain  
" strictly perfect in all latitudes."

*To correct Heeling Error.*—The heeling error is corrected for any given magnetic latitude by placing a vertical magnet exactly under the centre of the Compass card, with its N. or red pole uppermost if the heeling error is to windward or to the high side of ship, or its S. or blue end uppermost if to leeward or to the low side of ship, moving the magnet to or from the Compass until the heeling error is corrected.

*Notes.*—The heeling error, due to the permanent part of the magnetism, varies inversely as the earth's horizontal force, and consequently is greatest in high latitudes, diminishes as the ship approaches the magnetic equator, and increases again, still retaining the same name, as the ship recedes from the magnetic equator in the Southern Hemisphere. The heeling error, due to transverse and vertical soft iron, decreases as the ship approaches the magnetic equator, where it is zero, and is of a contrary name in the Southern Hemisphere. It is probable that the poles of the vertical magnet may require to be reversed in high southern latitudes.

A divided scale should be marked or fitted outside the tube or some other convenient place, so as to show the proper position for the correcting magnet as found in any given magnetic latitude, and the same recorded as a guide for approximately placing the magnet in position on any subsequent voyage in the same locality, and especially on the return of the ship to the United Kingdom.

Candidates should understand that the object of tentative adjustment is to bring the deviations within manageable limits, and also to equalise the directive force of the needle so far as is practicable on all courses; but no system of adjustment whatever is sufficiently reliable in character to absolve the navigator from the necessity of using every precaution, and especially of ascertaining the deviation on every available opportunity by observations of the sun by day and the other heavenly bodies by night.

#### APPENDIX N.

(From Memorandum on Examination of Engineers.)

#### EXAMINATION OF A MASTER OR MATE IN STEAM

The regulations under which these examinations are conducted are printed at pages 41 to 43 of the regulations for examinations of masters and mates. (Exn. 1.)

A candidate for this examination is required to have a thorough grasp of the construction of the steam engine and boiler, to enable him, in the first place, to understand the nature and importance of any defect which may be reported to him by the engineer, and so that he may work in harmony with the engineer in affording time and facilities for disconnexions, inspections, adjustments, and repairs.

To have a looking-on knowledge of what the principal repairs are about engines and boilers and pipes, and how these repairs are accomplished.

To be able to form an independent opinion as to a breakdown and the consequent propriety or impropriety of proceeding under steam with temporarily repaired or defective machinery.

To understand how to estimate approximately the reduction of fuel required for reduced speed, and consequently to sanction such reduction of speed as may seem to him to be warranted by the report of the engineer, and to satisfy himself before leaving port that there is sufficient coal for the voyage.

To have an intelligent grasp of the general run of pipes and connexions in the engine room, the marking of cocks, the opening and closing of cocks and valves, how mistakes of importance may be made in the confusion of an accident, and how best to guard against such mistakes.

To be capable of being left in charge of the feeding of a set of boilers, to understand the working of the water-gauge, and to be able to guard against being misled by false indications of the gauge glass.

To understand about blowing down and surfacing, the reasons for doing so, and the danger which may result from the neglect of these under certain circumstances. A master or mate presenting himself for examination in steam must be understood to have made up for his want of practical experience by reading up

about the steam engine. He ought, therefore, to show that he has given his mind to intelligently understanding the *rationale* of the action of the steam engine. Under this head, he should, therefore, be able to state approximately the quantity of heat required in the formation of steam, the remarkable relation of "latent" heat to "sensible" heat, using these popular names, how much steam can be raised by the combustion of one pound of coal, what horse-power measure is, what indicated horse-power is, the action of the slide-valve, the course of the steam through the engine, the advantage of working expansively, and how the expansive action is shown by the indicator diagram.

The candidate has to answer in writing 16 out of 20 questions selected from the book of Elementary Questions.\* Selections for this examination are given on the alphabetic sheet for "Steam." Generally, these answers are given by candidates as learned by rote from a book; the candidate should therefore be asked such *vivā voce* questions as will necessitate his giving his answers in different words, so as to discover whether he has the root of the matter in him.

The principal part of the *vivā voce* is the examination on board a steamer, preferably one with which he is unacquainted. He is told to look about and try to find out the run of the machinery without the assistance of any one; the Examiner to be in the engine-room to see that this independent examination is properly carried out. When the candidate reports that he thinks he knows the whole arrangement of the machinery, the Examiner will then question him on the uses of the parts, get him to point out the different cylinders, pumps, valves, condenser, &c. He must show that he understands the run of the pipes in the bilges, not necessarily that he has gone over every one of them, but he ought to be directed to trace, at least, one important range of pipes, and to thoroughly satisfy the Examiner that he could be safely trusted to manipulate the valves or cocks in connexion therewith. It will not often be practicable for the candidate to be asked to actually work engines under steam, but he must satisfy the Examiner that he knows how to do so, and that he is aware what precautions have to be taken in regard to water in the cylinder, &c. It is most important that a candidate should show that, in the event of an accident depriving him of the assistance of engineers, he knows what to do to safely take his vessel to an anchorage, or to stop the engines and proceed under sail alone.

The examination of a mate in steam is the same as that of a master. The knowledge is not with reference to the mate's position. A mate may be examined, but such examination implies that the mate will one day be a master, when the possession of the knowledge will be an advantage to him in the discharge of his duties as master.

#### APPENDIX O.

The following is a reprint of

### INSTRUCTIONS TO EXAMINERS OF MASTERS AND MATES.

1. The Examiners already understand that they are to be very careful (in examining all applicants for Certificates of Competency) to satisfy themselves that the applicants understand the Rule of the Road at Sea, and should decline to pass every applicant who does not understand it.

2. As a serious misapprehension has, however, arisen in a recent case in which Sound Signals were being made by a steamer under way in thick weather, contrary to the express wording of Articles 12a and 19 of the Regulations, it is more than ever incumbent on Examiners not to pass any applicant unless the Examiner is satisfied that the applicant understands that the Signals named in Article 19 are purely optional, and are only allowed to be made in cases in which the weather is so clear that the ship making them has the other vessel in sight.

3. Any Master using these *optional* Sound Signals, even when the other vessel is in sight, does so in every case on his own

responsibility ; but if he uses them when the other vessel is *not* in sight, he commits a very serious act of disobedience to the Regulations, and must abide the consequences of his illegal act.

4. Applicants must be made to understand that the compulsory Sound Signal which *must* be made by a steamer under way in a fog is a prolonged blast under Article 12a, and no other Sound Signal.

5. In examining an applicant on the application of Articles 12 and 13, the Examiner should, by answers to questions, ascertain that the applicant understands that it is his duty to go at a moderate speed in fog, while, as regards Article 24, the Examiner should impress on the applicant that an "ordinary precaution" to be observed in the navigation of a steam-ship in a fog is to get the way off his own vessel immediately he hears the Sound Signal of another steamer, and then he should go ahead very slowly, blowing the "prolonged blast" at intervals, and feeling his way until all danger of collision is passed.

#### APPENDIX P.

FORMS used in connection with the EXAMINATION and CERTIFICATES of MASTERS AND MATES.

Name of Form.	Initial Letters and Numbers.
Regulations relating to the Examinations of Masters and Mates.	Exn. 1
Masters' and Mates' Form of Application for Examination.	Exn. 2
Form of Application for Examination (Colours) ...	Exn. 2a.
Examination Paper, to be used in the examination of Second Mates.	Exn. 4
Ditto, to be used by all candidates when appearing for examination for the first time only.	Exn. 4a.
Ditto, Second Mates ... ...	Exn. 5
Ditto, Only and First Mates ... ...	Exn. 6
Ditto, ditto ditto ... ...	Exn. 6a.
Ditto, Masters, Ordinary ... ...	Exn. 7
Ditto, for adjustments of the Sextant ...	Exn. 9a.
Ditto, Examination in Chart (for Mates)...	Exn. 9c.
Ditto, (for Masters) ... ...	Exn. 9d.
Examiners' Report of Masters' and Mates' Examination	Exn. 14
Examiners' Authority for delivery of Certificate to successful candidate.	Exn. 16
Examiners' Certificate (Colours) ... ...	Exn. 16d.
Ditto authority for return of Fee to unsuccessful candidate (Colours).	Exn. 17a.
Ditto Report on Colours tests ... ...	Exn. 17b.
Application for renewed Certificate ... ...	Exn. 23
Deviation cards ... ... ... ...	Exn. 24
Napier's Diagram ... ... ... ...	Exn. 25
Examination paper on Cyclones on revolving storms ...	Exn. 32

BENGAL.

Government of  
Bengal.

By the Honourable the Lieutenant-Governor of Bengal.  
In accordance with Her Majesty's order in Council of the 29th June 1882, issued  
under section 8 of the Merchant Shipping (Colonial) Act, 1869.

**Colonial Certificate of Competency**

MASTER.

W

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil the  
duties of MASTER in the Merchant Service, I do hereby, in pursuance of Act I of 1869, grant you this Certificate of  
Competency.

By order of the Government of Bengal.

this \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.

Under-Secy. to the Govt. of Bengal.  
Registered at the Office of the Port Officer of Calcutta.

BENGAL.

## No. of Certificate ▶

*Address of Owner* \_\_\_\_\_  
*Date and Place of Birth* \_\_\_\_\_  
*Signature* \_\_\_\_\_

*This Certificate is given upon an ORDINARY EXAMINATION passed at \_\_\_\_\_ on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
 \_\_\_\_\_*

*Any MASTER or MATE who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic., cap. 63, sec. 23, to cancel or suspend Certificates.*

*N. B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.*

*Issued at the Port of Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
 \_\_\_\_\_*

BENGAL.

Government of Bengal

By the Honourable the Lieutenant-Governor of Bengal.  
In accordance with Her Majesty's order in Council of the 29th June 1882, issued  
under section 8 of the Merchant Shipping (Colonial) Act, 1869.

### Colonial Certificate of Competency

As  
FIRST MATE.

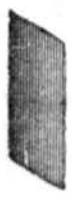
To

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to fulfil  
the duties of FIRST MATE in the Merchant Service, I do hereby, in pursuance of Act I of 1869, grant you this Certificate  
of Competency.

By order of the Government of Bengal,

this \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_

Under-Secy. to the Govt. of Bengal,  
Registered at the Office of the Port Officer of Calcutta.

BENGAL.No. of Certificate 

Address of Owner \_\_\_\_\_  
Date and Place of Birth \_\_\_\_\_  
Signature \_\_\_\_\_

This Certificate is given upon an ORDINARY EXAMINATION passed at \_\_\_\_\_ on the \_\_\_\_\_  
 day of \_\_\_\_\_ 18\_\_\_\_\_.  
 \_\_\_\_\_

Any MASTER or MATE who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Rs. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic., cap. 63, sec. 23, to cancel or suspend Certificates.

N. B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.

Issued at the Port of Calcutta on the \_\_\_\_\_ day of \_\_\_\_\_ 18\_\_\_\_\_.  
 \_\_\_\_\_

BENGAL.

Government of Bengal. By the Honourable the Lieutenant-Governor of Bengal.  
In accordance with Her Majesty's order in Council of the 29th June 1882, issued  
under section 8 of the Merchant Shipping (Colonial) Act, 1869.

## Colonial Certificate of Competency

AS

ONLY MATE.

Whereas it has been reported to the Lieutenant-Governor that you have been found duly qualified to  
fulfil the duties of ONLY MATE in the Merchant Service, I do hereby, in pursuance of Act I of 1859, grant you this Certificate  
of Competency.

By order of the Government of Bengal,

this \_\_\_\_\_ day of \_\_\_\_\_ 18 \_\_\_\_\_.

Under-Secy. to the Govt. of Bengal.  
Registered at the Office of the Port Officer of Calcutta.

BENGAL.No. of Certificate

<i>Address of Owner</i>	<i>Date and Place of Birth</i>	<i>Signature</i>
_____	_____	_____
<p><i>This Certificate is given upon an ORDINARY EXAMINATION passed at _____ on the _____ day of _____ 18_____.            Any MASTER or MATE who fails to deliver up a Certificate which has been cancelled or suspended is liable to a penalty not exceeding Re. 500. This Certificate is liable to be cancelled or suspended by any Court or Tribunal which has power under the Imperial Act 25 and 26 Vic., cap. 63, sec. 23, to cancel or suspend Certificates.</i></p>		
<p><i>N. B.—Any person other than the owner thereof becoming possessed of this Certificate is required to transmit it forthwith to the Port Officer, Calcutta.</i></p>		
<p><i>Issued at the Port of Calcutta on the _____ day of _____ 18_____.            _____</i></p>		

## NOTIFICATION.

No. 26 Marine, dated Calcutta, the 31st January 1890.

UNDER the powers conferred upon him by section 10 of Act I of 1859, and with the sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to make the following rules for the examination of persons desirous of obtaining local certificates of competency as Masters and Mates in the Mercantile Marine. These rules supersede those contained in the Notification of the General (Marine) Department of this Government, dated the 28th August 1877, and published in the *Calcutta Gazette* of the 29th idem.

W. B. BESTIC,

*Under-Secy. to the Govt. of Bengal.*

Certificates granted to persons who pass examinations.

Examinations continued till all the Candidates are examined.

Notice of application for examination to be given to the Port Officer.

Testimonials of character, conduct and ability required.

Testimonials of Foreigners.

Certificates as to Age.

Foreigners to know English.

Verification of Services by the Port Officer.

1. Certificates of Competency will be granted to those persons who pass the requisite examinations and otherwise comply with the requisite conditions. For this purpose examiners have been appointed, and arrangements have been made for holding the examinations periodically at the Port of Calcutta. The examinations will be held twice a quarter or at such other times as the Government may appoint.

2. The examinations will commence early in the forenoon, and will be continued from day to day until all the candidates whose names appear upon the Port Officer's list on the day of examination are examined.

3. Candidates for examination must make their application upon the appropriate Form (Exn. 2), which must be filled up at the Port Office. The Exn. 2, properly filled in, together with the Candidate's testimonials and discharges, must be lodged with the Port Officer of Calcutta, not later than the day before the day of examination, and the Candidate must conform to any regulations in this respect which may be laid down by the Government; as, if this be not done, delay may be occasioned.

4. Testimonials of character, and of sobriety, experience, ability, and good conduct on board ship for at least the twelve months of service immediately preceding the date of application to be examined, will be required of all applicants, and without producing them no person will be examined. As such testimonials and discharges have to be verified before the Candidate can be examined, it is desirable that they should be handed in together with the Form Exn. 2 as early as possible.

5. The testimonials of servitude of Foreigners and of British seamen serving in foreign vessels, which cannot be verified by the Port Officer, must be confirmed either by the Consul of the country to which the ship in which the Candidate served belonged, or by some other recognized official authority of that country, or by the testimony of some credible person on the spot having personal knowledge of the facts required to be established. The production, however, of such proofs will not of necessity be deemed sufficient. Each case will be decided on its own merits, and if the sufficiency of the proofs given appears to be at all doubtful, it must be referred to the Government.

6. Should any doubt exist as to the age of a Candidate, he will be required to produce a certificate of birth or baptism.

7. Foreigners must prove to the satisfaction of the Examiners that they can speak and write the English language sufficiently well to perform the duties required of them on board a British vessel. In the case of natives of India, who may not be able to speak English, their Certificates shall be endorsed to the effect that they are only valid for vessels manned and officered entirely by Asiatics.

8. The time for which length of service as Seaman or Officer in the Mercantile Marine is to be reckoned in all cases referred to in the following paragraphs is to commence at the date when the articles of agreement were signed by the applicant, and to end at the date when he was discharged as shown in the articles of agreement. The certificates of discharge will generally be sufficient evidence of this, but great care must be exercised by the Port Officer and Examiners to detect any tampering in any way with the information contained in them, and to report to the Government at once any suspicious cases.

9. Services which cannot be verified by proper Entries in the Articles of the Ships in which the Candidates have served cannot be counted. For instance, a man will state his service to have been as Second or Only Mate, and to support his assertion will produce a Certificate of Discharge or of Employment by the Master to the effect that he served as Mate, when, on reference to the articles, it appears that he has actually been rated as Boatswain: the service in such a case will not be regarded as having been in the capacity of Mate.

10. Time for which Indentures of Apprenticeship are in Service as an Apprentice will be accepted as sea service, provided that the Apprentice has remained by the ship for at least four-fifths of the time covered by the Indentures, and that the Indentures of the applicant are endorsed by the Owner or Master to whom he has been bound to the effect that he has performed his service faithfully for the whole time agreed upon.

12. Service as Second, Third, or Fourth Mate may be Service as 2nd, 3rd or 4th Mate accepted as equivalent to service as First or Only Mate to qualify for Master. of Competency, provided he can produce satisfactory evidence of his having served at sea 12 months as Second, Third, or Fourth Mate of a Foreign-going Ship while in possession of a First Mate's Certificate of Competency, valid in the United Kingdom. It will be noted that occasional service in charge of a watch in the daytime will not be accepted as Mate's service under the Regulations.

13. Part of the time served on board a training ship will Service on board a Training Ship. be allowed to count as service at sea, provided that the Candidate can produce amongst his testimonials a Certificate from the Committee that he has conducted himself creditably, and passed a good examination in seamanship so far as practised in the training ship as well as in other matters down to the time of his leaving the ship.

14. No period of service on board a training ship will be allowed to count for more than one year's sea service.

15. Candidates whose services have been in capacities other than Apprentice, Ordinary Seaman, or Able Seaman, e.g., Cook, Steward, Carpenter, &c., will be required to satisfy the Port Officer that they have a good knowledge of Seamanship. This may possibly be proved by the production of satisfactory Certificates from Masters with whom the applicants have served. Failing satisfactory evidence, the applicant may be required to perform additional service, which must be in the capacity of Ordinary Seaman or Able Seaman.

16. Service performed on rivers, no matter of what size, or in smooth water or partially smooth water limits, cannot be accepted. Service on rivers and in smooth water.

17. A person who has lost the sight of one eye cannot be permitted to be examined for a Certificate of Competency. Partial loss of sight. If he already holds a Certificate, he cannot be examined for a Certificate of a higher grade.

18. Service in Light ships or in an Engine-room will not be accepted as sea service for a Master's or Mate's Certificate of Competency. Service in Light ships and Engine-room.

19. Service as a First Class Pilot will be accepted as qualifying for examination for a Master's Certificate for Home Trade Ships, notwithstanding that he may not have served in the capacity of Mate, but only provided that his Sea Services are sufficient. For the purpose of this rule, a Hooghly Master Pilot will be held to be a First Class Pilot.

20. Half the amount of service performed as an Apprentice in a Pilot Ship propelled by sails may count as actual Sea Service to qualify for examination for a Certificate of Competency. Service as Pilot's Apprentice.

21. Service performed in Tug Boats employed in Sand-heads Service or outside Port limits may be accepted as Sea Service for qualifying for a Mate's Certificate for Home Trade Ships. Service on Hooghly River survey vessels may be accepted on the same conditions. Service in the Hooghly Pilot vessels at the Sandheads is Sea Service. Service in Tug Boats.

22. Candidates who have neglected to join their vessels after having signed Articles, or who have deserted their vessels after having joined, or who have been found guilty Desertion and gross misconduct.

of gross misconduct on board, will be required to produce satisfactory proofs of two years' subsequent service and good conduct at sea, unless the Government, after having investigated the matter, should see fit to reduce the time.

If after passing examination services are found to have been insufficient.

Certificate of a lower grade may be granted on certain conditions.

Must be re-examined for certificate of higher grade.

23. If after a Candidate has passed his Examination it is discovered on further investigation, e.g., by verification on the part of the Port Officer, that his services are insufficient to entitle him to receive a Certificate of the grade for which he has passed, it will not be granted to him; but if the Government are satisfied that the error in the calculation of his services did not occur through any fault or wilful misrepresentation on his part, he will be allowed to go up for re-examination without payment of a further fee when he has performed the amount of service in which he was deficient.

24. If in such a case the applicant's services are sufficient to entitle him to receive a Certificate of a lower grade, provided as aforesaid he has not wilfully misrepresented the amount of his services, an Inferior Certificate may be granted to him, and the difference, if any, between the fee paid by him for the Superior Certificate and the fee payable for the Inferior Certificate, may be placed to his credit.

25. In such a case, when the applicant has by further service made up the amount in which he was found to be short, he must, before he can receive the higher Certificate, be re-examined in all the subjects.

#### Colour Tests.

26. The Local Government have made the following arrangements for the examination of persons as to their ability to distinguish colours:—\*

27. Examinations in Colour are open to any person serving or about to serve in the Mercantile Marine.

28. Any person, including the holders of Certificates of Competency, or persons about to apply for Certificates of Competency, if desirous of being examined *in Colours only*, must make application to the Port Officer on Form Exn. 2<sup>a</sup>, and pay a fee of one rupee.

29. He must on the appointed day attend for examination at the Examiner's Office; and if he passes he will receive a certificate to that effect.

30. If he fails it will be open to him to be examined again in Colours as often as he pleases on payment of the fee of one rupee at each fresh attempt.

31. The application of a Candidate who is presenting himself for Examination for a Master's or Mate's Certificate must be made on Form Exn. 2. Such examination will commence with the Colour test; and if the Candidate does not, at the time of making application, hold a Certificate of Competency of any grade, and should fail to distinguish correctly any of the colours used in the test, he will not be allowed to proceed with the examination in Navigation and Seamanship.

32. The fee he has paid for Examination for a Certificate of Competency will include the fee for the Colour test, and, with the exception of one rupee, will in such event be returned to him.

33. A Candidate for Examination for a Certificate of Competency who, at the time of making application, does not possess a Certificate, and who fails to pass the Colour test, may not be re-examined until after the lapse of three months from the date of his first failure. If he fails a second time, he will be allowed a third trial at the expiration of another three months from the date of his second failure. A fresh fee must be paid at each succeeding examination.

34. It is therefore obviously to the advantage of Candidates for Certificates of Competency to apply in the first instance to be examined in *Colours only* on Form Exn. 2<sup>a</sup>.

35. A Candidate who holds a Certificate of Competency, and who, on presenting himself for Examination for a Certificate of a higher grade, is unable to pass the Colour test, will notwithstanding be permitted to proceed with the Examination in Navigation and Seamanship for the Certificate of the higher grade.

\* See Appendix O.

36. Should he pass this examination, the following statement will be written on the face of the higher Certificate which may be granted to him, viz.—“ This Officer has failed to pass the Examination in Colours.”

37. Should he ultimately fail to pass the Examination in Navigation and Seamanship, a like statement, relating to his being Colour blind, will be made by the Port Officer on his existing Certificate before it is returned to him.

38. Holders of Certificates which bear the statement of their having failed to pass in Colours, and who may desire to have the statement removed from their Certificates, must obtain the special permission of the Government.

#### Qualifications for Certificates of Competency for a Home Trade Ship.

40. All Candidates for Certificates of Competency must first be examined in Colours.\*

41. A MATE must be not less than 19 years of age, and have served four years at sea.

No candidate will be allowed to be examined unless he has served two years at sea within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.

42. IN NAVIGATION, &c.—He must write a legible hand, and understand the first five rules of arithmetic, both simple and compound. He must be able to take a bearing by compass, and be conversant with the use of Mercator's chart, and be able to find, on either a “true” or “magnetic” chart,† the course to steer, and the distance from one given position to another; to find the ship's position on the chart from cross bearings of two objects; from two bearings of the same object, the course and distance run between taking the bearings being given; and the distance of the ship from the object at the time of taking the second bearing.

43. He must also pass an examination in the International Code of Signals.‡

44. IN SEAMANSHIP, &c.—He must possess a thorough knowledge of the rule of the road as regards both steamers and sailing vessels, their regulation lights, and fog and sound signals.§ He must be able to describe the signals of distress, and the signals to be made by ships wanting a pilot, and the liabilities and penalties incurred by the misuse of these signals;|| also the use and management of the rocket apparatus in the event of his vessel being stranded. He must be able to mark and use the lead and log lines, to moor and unmoor a vessel, and to manage a ship's boat in heavy weather, &c., &c. He must also understand the construction, use, and action of the bulkhead sluices, the engine-room telegraph, &c., and to answer any other questions of a like nature appertaining to the duties of the Mate of a Home Trade Vessel which the Examiners may think proper to put to him.

45. A MASTER must be not less than 20 years of age, and have served five years at sea, of which one year must have been as First or Only Mate in the Home or Foreign Trade, during which service he must have been in possession of a Mate's Certificate for Home Trade Ships or of a First or Only Mate's Certificate for Foreign-going Ships. *Vide also para. 19.*

No candidate will be allowed to be examined unless he has served at sea two years within the last six years, and six months within the last three years immediately preceding the date of his application to be examined.

\* See Appendix F.

† See Appendix D. The terms “true” and “magnetic” are used throughout the Regulations for the sake of brevity and convenience for indicating charts that have compasses engraved upon them, showing the “true” or “magnetic” point of the compass respectively.

‡ See Appendix A.

§ See Appendix B.

|| See Appendix C.

**Any cases not coming within the above conditions must be submitted for the special consideration of the Government before the candidate is allowed to be examined.**

**46. IN NAVIGATION, &c** — In addition to the qualifications required of a Mate of a Home Trade Ship, a Master will be required to find on a chart the course to steer by compass in order to counteract the effect of a given current, and to find the distance the ship will make good towards a given point in a certain time, and to *work out practically* the correction to apply to soundings taken at a given time and place, to compare with the depth marked on the chart,\* &c He will also be required to understand the use of the quadrant, to be able to observe with it, to read off and on the arc, and to find the index error by the horizon. He will also be required to find the latitude by a meridian altitude of the sun, and to give written answers (*vide supplementary and notes t*, page 40) to certain practical questions on the subject of the deviation of the compass †

**47. IN SEAMANSHIP, &c** — In addition to the qualifications required of a Mate of a Home Trade Ship, a Master must understand how to lay a sea anchor, and what means to apply to keep a steamer with machinery disabled out of the trough of the sea, &c How to get a cast of the lead in heavy weather, &c He will be examined as to his resources for the preservation of the crew and passengers in the event of wreck, and the steps to be taken if his vessel is disabled and drifting towards a lee shore, and will be required to answer any other questions appertaining to the management of Home Trade Vessels which the Examiner may think necessary to put to him

#### Failure.

**R - examination in case of failure**      48. In all cases of failure the Candidate must be examined *de novo*. If a Candidate fails in *Seamanship*, he will not be re-examined until after a lapse of SIX MONTHS. Whether the whole or part of this period must be served at sea must depend upon the subjects in *Seamanship* in which the Candidate failed, but what amount (if any) of sea service will be required will be left to the discretion of the Port Officer, subject, however, to revision by the Government should they see fit.

49. The Examiners in making out their Report on Form Exn. 14 should state what amount (if any) of further sea service the Candidate must perform, and they should also insert this information under Division II in Form Exn. 2

50. If he fails three times in *Navigation* he will not be re-examined until after a lapse of THREE MONTHS from the date of the last failure.

**Certificates of a lower grade**      51. If a Candidate has failed in his Examination, but the subjects in which he has failed are not included in the subjects required for a certificate of a lower grade, he may, if he desires it, receive a certificate of such lower grade

52. No part, however, of the fee he has paid will be returned to him, and on presenting himself, when entitled, for re-examination for the higher grade of Certificate he will be required to pay a further full fee.

53. If a Candidate fails for bad spelling or writing, he will not be re-examined until after a lapse of at least three months.

#### Fees.

54. Candidates for examination, in making their application on Form Exn. 2, will be required to pay the examination fee before any step is taken, whether by enquiring into their services or testing their qualifications, &c. Should it be found that their service is not sufficient to entitle them to be examined, or should their testimonials be unsatisfactory, or should they from any other cause, except failure to pass the colour tests, not be examined, no part of the fee will be returned to them, but when they have fulfilled the requisite service, or are able to produce satisfactory testimonials, as

\* See Appendix D.  
† See Appendix E.

the case may be, they will be allowed to again present themselves for examination for a Certificate of the same grade without paying any further fee.

55. The fee for examination must be paid to the Port Officer. In any case in which a Candidate offers money to any other officer, and in any place but in the Port office, the Candidate so offering money will be regarded as having committed an act of misconduct, and will be rejected, and not allowed to be again examined for twelve months.

56. If a Candidate fail in his examination, no part of the fee he has paid will be returned to him.

57. The fees are as follow :—

Fees to be paid by applicants for examination.

132. Fees to be paid by applicants for examinations.

#### FOR "HOME TRADE SHIPS."

	Rs.
Mate ... ... ... ...	6.
Master ... ... ... ...	12
For the renewal of any certificate ...	5

#### General Instructions to Examiners and Candidates.

58. All instruments necessary for use in the examinations are supplied by the Government.

Instruments used in examinations.

59. Before commencing the examination, the tables or desks must be cleared of all scraps of paper or books that are not used in the examination, and care should be taken that the candidates do not bring into the examination room any book, paper, document, or memoranda of any description whatever. No person whatever should be allowed in the room during the time of examination, but those whose duties require them to be present.

Prohibited books and papers.

60. No instructors will be allowed on the premises.

61. Candidates will under no pretence whatever be allowed to leave the premises while the examination is proceeding. If a candidate has occasion to visit the retiring room, he will only be allowed to do so on the completion of the paper on which he may be engaged, when he will be required to enter in a book kept for the purpose the exact times of his leaving and returning to the examination room. When only a few candidates are under examination, two persons will not be allowed to leave the room at the same time.

Candidates not to leave premises during examination.

62. Candidates should be so placed as to prevent one copying from the other, and no communication whatever between the Candidates should be allowed.

Position of Candidates at examination.

63. If any blotting paper is allowed, it should be black ; Blotting paper. and when the first examination paper is issued, each Candidate should be furnished with a piece, which must be returned to the Examiner upon the completion of the last paper.

64. The examination papers should be issued to the Candidates in half sheets only, and one at a time. This will prevent a Candidate from spreading out the sheets on the table in an apparently careless manner, but so as to enable his nearest neighbour to look over and copy, or examine the problems. It will also enable the Examiner to look over and report upon the work on one half sheet, while the Candidate is at work upon another, and so on. When the errors are not too numerous, or when they are not from ignorance of the subject, the incorrect problems may be returned to the Candidate for correction, but in no case should the errors be pointed out by the Examiner, neither should any marks be made on the correct work of the problem, which would at once indicate how far or to what extent the work is correct. Should the problems be returned to the Examiner the second time incorrect, this would be a failure ; and as the time allowed is considered ample for working out the papers carefully, this rule is expected to be strictly observed.

How examination papers should be issued.

65. When from the large number of the candidates it may be found impossible to look over the work on the day of examination during the office hours, on morning following examination day, some time in the morning of the following day may be allotted for the purpose of correcting the problems, but

In certain cases problems may be corrected on morning following examination day.